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LAND USE PROBLEMS
in
SOUTHWESTERN NORTH DAKOTA

(A report on present conditions in nine sample areas and an estimate of the adjustments required to correct the present misuse of the natural agricultural resources)

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Land Use Planning Section
Land Utilization Division, Region VII
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Table of Contents

Table of Contents (Cont'd)

List of Figures

List of Tables

ACKNOWLEDGMENTS

This publication contains information concerning the present land use in Southwestern North Dakota and the relationship of this use to the use suitability of the land, together with estimates of the changes in number, size and organization of the present operating units that are necessary in order to eliminate present misuse of natural agricultural resources and the accompanying chronic rural relief. Such climatological, historical, economic and sociological data as seemed pertinent to this study have been incorporated in this report, together with a detailed study of 263 farm schedules taken from farmers in 9 sample townships in the Missouri Slope Area.

Acknowledgment is due Mr. A. P. Nelson, Wm. E. Purdy and M. L. Jackson for the classification of the soil as to use-suitability. Much valuable advice and constructive criticism was given by Mr. T. S. Thorfinnson, Regional Chief Land Use Planning Section, H. A. Steele, and C. H. Plath in the direction of the study and the preparation of this report. Others who assisted with the field work and the tabulations include R. L. Schafer, Paul M. Brown, John R. Loewenstein and R. B. Hile. Drafting of maps and charts included in this publication was done by the Cartographic Section of the Regional Office of the Resettlement Administration at Lincoln, Nebraska, and Official Project No. 65-73-2363 of the WPA.

The detailed soils maps of the five sample areas located in Morton County, North Dakota, were secured from the Soils Department of the North Dakota Agricultural College.

Much of the description and history of the Missouri Slope Area included in this report has been taken from the "Soil Survey of Western North Dakota", written by Macy H. Lapham and party in 1908.

INTRODUCTION

The present misuse of natural resources in the Missouri Slope Area* in North Dakota has resulted in depleted range and wind and water eroded crop land, with accompanying chronic economic and human distress. It is true that the severe drought conditions of the past few years have added to the general distress of the area, but the drought merely impressed the nation with the importance and severity of an economic problem which has been slowly growing and steadily becoming more apparent and pronounced under our past policy regarding the use of the natural resources of the country.

It was decided at a meeting of members of the Washington, Regional and State staff of the Land Use Planning Section, Land Utilization Division of the Resettlement Administration held at Rapid City, South Dakota, during August 1936, that one of the most important activities which the North Dakota staff could undertake during the present fiscal year was a study of the conditions in the Missouri Slope Area with the view of evaluating the present maladjustments and developing a comprehensive plan which would tend to correct some of these maladjustments and ameliorate the accompanying economic and social distress of the area.

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* See Figure No. 1

The Missouri Slope Area in North Dakota is so extensive that it was impossible to cover it in a detailed study with the funds and personnel available. Thus, it became apparent that if any detailed study of the problem was to be made, it must, of necessity, be limited to a small area. Consequently, the sample area method of approach was adopted.

PURPOSE

The purpose of this study was to determine the proper use of the land in order to conserve natural and human resources, and to evaluate some of the maladjustments now existing within the area such as misuse of land, uneconomic size and type of farms, tax delinquency and other public finance problems. When and if the proper use of the land is determined and present maladjustments are properly evaluated it should then be possible to recommend an action program which will eventually tend to preserve natural resources and to ameliorate the present unsatisfactory distressed condition of the land and the people living on the land. It was also the purpose of this study to evaluate the sample area research procedure, and to develop, if possible, a methodology or technique which is suitable for this type of research work.

PROCEDURE

The first step taken in this study was the selection of sample areas which were believed representative of the Missouri Slope Area. The location of the areas was determined after a thorough consideration of all available information on physical, economic and social conditions in the Missouri Slope Area as a whole and in the several sample areas. The available information studied included the Land Classification Map of the Northern Great Plains by the Geological Survey; U. S. Census data on percent of land under cultivation, number, size, type and organization of farms, value of land per acre, and the value of farm buildings, farmers' dwellings and farm machinery per acre and per farm; land ownership pattern; tax delinquency; reconnaissance soil and soil erosion maps. Since a detailed soil survey was just being completed in Morton County, it was believed advisable to locate as many of the sample areas as possible within this county, in order to have available, at no added cost, the necessary soils information for a sound land-use classification.

After studying all the available information mentioned above several sample areas in Morton County were tentatively selected. Then a reconnaissance field survey of these areas was made, noting the apparent misuse of the land, the topography and the type of soil, degree of erosion, number of farms and the condition of the farm buildings. The Morton County Agricultural Agent, Mr. R. C. Newcomer, was interviewed in regard to the selection of sample areas and, finally,

Townships 135-80, W½ 138-81 and E½ 138-82, 138-84, 138-89 and 138-90 were selected as suitable areas. At a later date four more sample areas outside of Morton County were selected, namely, Dovre (136-99) and Deep Creek (133-103) Townships in Slope County, Talbot (131-101) Township in Bowman County, and Wagendorf (133-96) Township in Hettinger County. However, no detailed soil survey or land classification is available for these last four townships and the study of these areas to date is limited to the social and economic data taken from the schedules secured from 102 farm operators living there in 1936.

These sample areas were assigned the following numbers:

T. 135 R. 80 - Area No. 1
T. 138 R. 90 - Area No. 2
T. 138 R. 89 - Area No. 3
T. 138 R. 84 - Area No. 4
W½ T. 138 R. 81 and E½ T. 138 R. 82 - Area No. 5
T. 136 R. 99 - Area No. 6
T. 133 R. 103 - Area No. 7
T. 131 R. 101 - Area No. 8
T. 133 R. 96 - Area No. 9

The location of these areas is shown in Figure No. 1.

Having selected the sample areas, farm schedules (either detailed or general) were obtained from each farm operator living within these areas. On these 263 schedules information regarding farm organization, present land use, pertinent social and financial data, and farmers' opinions on minimum size and type of operating unit* was obtained. The present land use in all the Morton County

* The term "operating unit" as used in this report means all of the land, livestock, and equipment controlled by one farmer or rancher, whether owned or leased.

sample areas was mapped by means of the plane table. The detailed soil survey maps of the several townships were used as base maps in mapping the present land use. Later several copies of these detailed soils maps of the Morton County areas were secured. From the information on these maps it was possible to classify the land in these areas as follows:

1. Land cultivated not suitable for cultivation (misuse)
2. Land cultivated and suitable for cultivation
3. Land not cultivated and not suitable for cultivation
4. Land not cultivated but suitable for cultivation

The above classification was mapped in place on township plats and also the acreage in each classification was measured and tabulated by operating units for the five sample areas located in Morton County.

Considerable data on tax history, school attendance, location and number of schools and children of school ages was obtained from county records by W. P. A. workers assigned to W. P. A. Project No. 65-73-2363.

The necessary forms for copying this data were supplied by the regional office of the Land Use Planning Section of the Resettlement Administration.

LOCATION AND EXTENT OF THE AREA

The Missouri Slope includes that part of the state of North Dakota which lies west of the Missouri River, a little over twelve

and one-half million acres, or approximately one-fourth of the total area of the state. The location of the nine sample areas located within this part of the state, as well as the area itself, is shown in Figure No. 1.

DESCRIPTION OF THE AREA*

Topography

The general topography of the Missouri Slope Area is an undulating to somewhat rolling prairie plain with low wide swales except where cut by stream valleys or marked by conical or flat topped buttes. The area is drained by the Missouri River and its tributaries, the Little Missouri, the Knife, the Heart, and the Cannonball Rivers. The valleys of these tributaries are from 100 to 300 feet in depth and sometimes are as wide as two miles or more, and are often bordered by steep to sloping bluffs. The valley sides are often dissected by short intermittent tributaries entering at nearly right angles and following steep-sided valleys, forming extensive areas of broken land which is sometimes eroded into characteristic "Bad Lands." The most extensive areas of Bad Lands occur in the area drained by the Little Missouri River which enters North Dakota near its extreme southwestern corner in Bowman County and after flowing a distance of 200 miles through the state enters the Missouri

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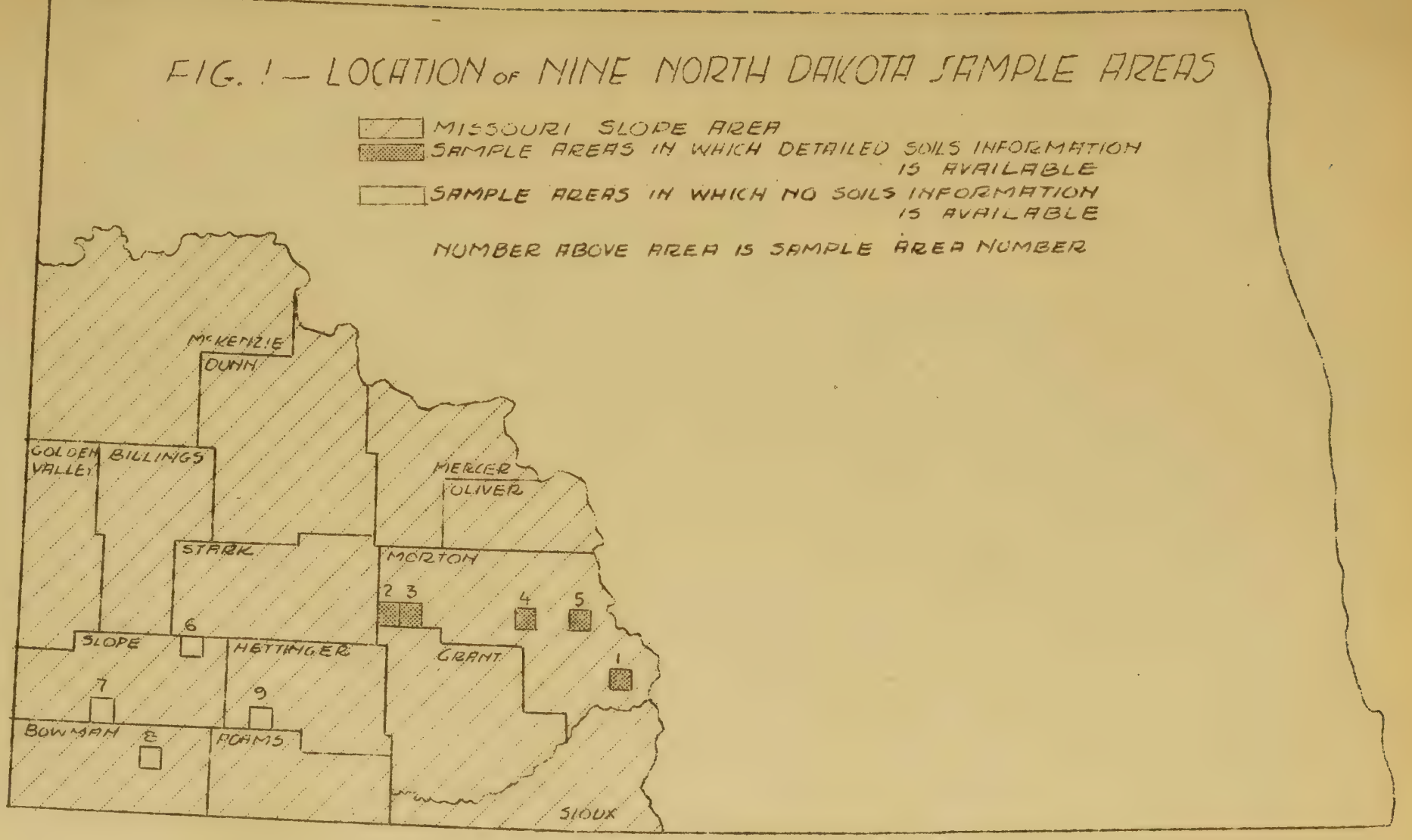
* Taken from Soil Survey of Western North Dakota by Macy H. Lapham and party - 1908.

NORTH DAKOTA

FIG. 1 — LOCATION OF NINE NORTH DAKOTA SAMPLE AREAS



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River in Dunn County. The variable topography has influenced the formation of the soils and the settlement and agricultural development of the area.

Soils

The soils of the area are known as residual soils, being derived from the weathering in place of the underlying rocks, and the detailed soils maps of that part of the area which has been mapped show a very intricate pattern, indicating extremely variable soils. Most of the soils possess potential fertility and the more extensive soils are generally suitable for cultivation where the topography will permit. Stoniness and claypan development are the principal soil factors which limit crop production in this area.

Climate

The most striking and characteristic climatic features of the area are a restricted and variable annual precipitation, long severe winters, and a relatively brisk wind movement. The average annual precipitation is rather limited for the successful production of crops under ordinary methods of farming, and the distribution of rainfall varies greatly from year to year. The greater proportion of the precipitation occurs during the summer months as heavy local showers, often accompanied by thunder and lightning - and frequently hail. The general distribution of the rainfall, however, is such as to favor the growth and maturity of crops, the greater proportion of the rain falling during the growing season, with the maximum usually occurring

in the four months of May, June, July and August, and a moderate amount in the spring and fall months. Comparatively little precipitation comes from November to February, inclusive. The years of greatest annual rainfall are not always the most favorable years for the production of crops, the harvesting of a successful crop apparently is dependent more upon the absence of hot, drying winds and upon the timeliness of the rainfall rather than upon the total amount precipitated.

The annual snowfall is generally subject to considerable variation ranging from a few inches to several feet. It is, however, usually of a dry character and is readily removed from the exposed prairie surface by winds. While deep drifts collect in draws, or other depressions, the exposed hillsides and slopes in the broken lands are usually swept clean and grazing is not greatly interfered with. Hailstorms occur frequently and are often very destructive. They are of local character, however, and while the destruction wrought to crops is often complete, it is confined to relatively narrow strips or to small spots, and only a very small proportion of the country is affected during any one season.

The winter season is long and generally marked by long periods of severe temperatures accompanying periods of clear, fair weather, brought about by the slow progress of areas of high pressure following the path of the usual cyclonic storms. During such periods, temperatures ranging well below zero generally prevail and extreme temperatures of from 30 to 40 degrees below zero are occasionally experienced.

Killing frosts may occur early in September, the average date of the first killing frost falling about the middle of this month.

While the winter season is protracted, with the advent of spring the advance of summer is rapid. The last killing frost is generally looked for from the middle to the latter part of May, but light frosts may occur in almost any month of the year. During the summer months the days sometimes become extremely warm, temperatures of 90° to 100° or even higher being reached. The nights are usually cool, however, for with the setting of the sun radiation takes place rapidly. A variation of from 50 to 60 degrees between the extreme temperatures of the day and night are sometimes experienced.

During the summer the percentage of sunshine is high and partly compensates for the short summer season.

The wind movement is generally brisk, particularly during the winter and spring months. Gales of considerable severity often accompany the local thunderstorms of the summer months. During the summer months there are brief periods of hot, dry winds resulting in excessive evaporation and often injuring the growing crops, especially when there is a lack of reserve moisture in the soil.

The following statement in the soil survey report written in 1908 during a period of heaviest settlement is quite significant when considered in the light of the present situation of over-extension of agriculture and the large number of small uneconomic units in the area. "There is at the present time a popular belief that a permanent

climatic change has taken place and that there will be no further repetition of successive seasons of unusual drought."

Table No. 1 gives adequate proof that the area has just passed through one more "repetition of successive seasons of unusual drought". It shows a comparison of actual and normal rainfall at five stations located within the Missouri Slope Area for the period January 1, 1929 to August 31, 1936. The average accumulated deficiency for the five stations for this period of approximately seven years is 21.82 inches. The severity of the 1936 drought is shown by the average deficiency for the first seven months of this year, an average of 7.71 inches for the five stations.

TABLE No. 1 Comparison of Actual and Normal Precipitation at 5 Stations Located within the Missouri Slope Area: January 1, 1929 to August 31, 1936

Station	Normal 1929 to 1935	Actual 1929 to 1935	Departure 1929-1935	Normal Jan.-Aug. 1936	Actual Jan.-Aug. 1936	Departure Jan.-Aug. 1936	Total Departure 1/1/29-8/31/36
Beach	113.05	107.08	-5.97	12.31	4.91	-7.40	-13.37
Dickinson	108.85	98.82	-10.03	12.53	4.82	-7.71	-17.74
Dunn Center	116.13	94.73	-21.40	13.18	5.64	-7.54	-28.94
Mott	124.32	104.96	-19.36	13.09	4.74	-8.35	-27.71
Carson	115.15	101.35	-13.80	12.55	5.01	-7.54	-21.34
Total	577.50	506.94	-70.56	63.66	25.12	-38.54	-109.10
Average	115.50	101.39	-14.11	12.73	5.02	- 7.71	- 21.82

Source: U. S. Weather Bureau

Native Vegetation

The native vegetation of the Missouri Slope Area included the following grasses of value for grazing and for the production of wild prairie hay; blue grama grass, western wheat grass, prairie June grass, Buffalo grass, sand grass, and needle grass. Of these the grama grass, buffalo grass, and the western wheat grass are the most valuable for grazing purposes. The western wheat grass is found principally upon the better soils where it soon crowds out all other grasses. The sand grass is usually found in areas where the subsoil is somewhat sandy, and although it makes a luxuriant growth, it is not very palatable or very nutritious. The blue grama grass is the most important of all the grasses listed above. It is palatable at all seasons of the year, cures well on the stalk and apparently withstands close grazing better than any other of the native grasses.

HISTORY OF THE AREA

The grazing of cattle and horses upon the public domain became an extensive industry at a comparatively early date. Attracted by the practically boundless prairie lands, providing during the summer excellent grazing and carpeted at the advent of winter with a short but nutritious covering of naturally cured grasses, the early ranchers settled along the sheltered valleys where water might be easily obtained.

Although the industry was subject to occasional and extremely heavy losses of stock during blizzards and heavy snows, the profits in those years of comparative freedom from loss were large and a considerable number of people engaged in this industry became wealthy.

From the more favored localities the ranching industry spread until it had covered practically the whole area. During the earlier days of the industry herds of many thousand cattle were ranged over extensive areas by a comparatively few companies. This was later followed by a period of settlement during which the small rancher, grazing from 200 to 600 head of cattle and horses, came in. The raising of stock on this more limited scale also became a profitable industry.

During the development of the ranching industry the idea prevailed that owing to the limited rainfall any extensive production of crops without irrigation upon the prairie land was impracticable.

There were a few ranches favorably situated along the stream bottoms that had for some time practised a desultory irrigation of the valley lands. This was usually restricted to the flooding of the valley bottoms in order to hasten or insure the growth of wild hay. Even after experiments by a few of the more progressive settlers in the irrigation or dry-land cultivation of small grains upon these valley lands had given good results, the ability of the upland prairies to produce crops was doubted. Early trials with cereals were made here with but little faith in their success, and sometimes resulted in partial or complete failure, owing to unusual drought, the use of varieties unadapted to the soil and climatic conditions, and to the crude cultural methods employed.

With demonstration that dry-farmed grain would succeed during seasons of average rainfall, a few of the ranchers, disheartened by unusually heavy livestock losses, turned their attention to farming. The success attained by some of these became more widely known, and the more attractive lands in the area were rapidly taken up by homesteaders.

The following paragraph from the Soil Survey of Western North Dakota written in 1908 is significant and prophetic but apparently was given little attention: "At present there is a tendency upon the part of the homesteader, anxious to obtain a free foothold for himself and family, to crowd too close upon the limits of the 'bad lands', or other hilly broken districts. In such instances it is frequently the case that only a comparatively small proportion, sometimes not more than a fourth, of the homestead can ever be profitably cultivated. The attempt to extend the domain of agriculture, when divorced from the raising of stock, into these unfavorable sections should be discouraged, as the production of grains or other field crops alone upon but a few acres of land under the climatic and other conditions here encountered can hardly fail to result in disaster and in retarding the development of the state. The growing of hay and forage crops upon the favorably situated areas of limited extent, in connection with the grazing of stock upon the native forage of the broken areas, however, carries possibilities of success, provided the settler can acquire possession or use of enough land to support a mixed farming and grazing industry. In general, the homestead of 160 acres is insufficient for this purpose,

and the areas of broken lands would be better left entirely to stock raising, or the homestead laws be so amended as to permit the homesteader in the more broken districts, under a thorough and careful system of classification and control, to acquire more than 160 acres."

THE CHARACTER AND SOURCE OF THE POPULATION

The earlier settlers, who engaged in stock raising, were almost exclusively native born Americans, although a few Germans and Scandinavians also figured in the development of this industry.

In the later development of farming the German-Russians and German-Hungarians have played a more important part. Most of these are descended from German ancestors who emigrated two or three generations ago to Russia, Hungary, or Bohemia. With some exceptions, these people, most of whom speak the German language, have come directly from their native land and had but little or no knowledge of American agriculture. They quite readily acquired such knowledge and adopted American methods and the use of farm machinery.

There are no very large cities in the area and with the exception of a comparatively limited number engaged in manufacturing, mining, and transportation, the most of the population depends directly upon agriculture or upon lines of endeavor supported indirectly by agricultural pursuits.

The population of the area, considered as a whole, is cosmopolitan, nearly every state in the Union and many of the European countries being represented. Most of the native born citizens have

come from Minnesota, Iowa, Illinois, Wisconsin, Indiana, South Dakota, and the eastern part of North Dakota. The population is, however, to a large extent composed of foreign born and their descendants, those of German-Russian and Scandinavian origin predominating. Table No. 2 showing the nationality of the farm operators interviewed in the nine sample areas bears this out.

Table No. 2 Nationality of 256 Farm Operators in 9 Sample Areas in Southwestern North Dakota - 1936

Area No.	German	Czecho-Slovakian Bohemian	Polish	Russian	Austrian Hungarian	American Canadian	English Irish Scotch	Swede Norwegian Danish	Dutch Belgian	Total
3	24	1	1	1	1	0	0	0	0	28
2	32	0	0	0	0	3	2	0	0	37
1	19	0	0	1	1	7	3	1	1	32
5	9	3	0	0	0	2	2	2	1	19
4	34	0	0	0	0	5	0	0	0	39
6	7	1	1	0	0	3	0	12	0	24
7	2	0	0	0	0	14	0	2	0	18
8	3	0	0	1	0	18	0	2	0	24
9	15	0	0	0	1	8	0	9	2	35
All Areas	145	5	2	3	3	60	6	28	4	256

PRESENT STATUS

The present status of agriculture in the Missouri Slope Area is brought out in Tables 3, 4 and 5. Of the 201,364 acres operated by

the 283 farmers in the nine sample areas 93,065 acres, or approximately 46%, was under cultivation and 180,299 acres, or approximately 54%, was in grass. Of the land in crops, 50% was seeded to wheat, 28% to feed grains, 15% was idle or summer fallowed, 3% in tame hay or pasture, 3% in flax, and 2% in rye.

Table 3. Distribution of acreage in crops and grass on the land operated by 283 farmers in 9 Sample areas in Southwestern North Dakota - 1936.

Kind of Use	Acres	Per cent
Total crop land (including idle and fallow)	93,065	46.1
Total grass land (including farmsteads, roads and waste)	108,234	53.9
Total land operated	201,299	100.0

Table No. 4. Distribution of crop acreage on 263 farms in 9 sample areas in Southwestern North Dakota - 1936

Crop	Acres	Per cent
Wheat	46,952	50.3
Flax	2,665	2.8
Rye	2,031	2.3
Feed grains, includes corn, oats, barley, speltz, etc.	23,308	25.1
Tame hay and pasture	4,521	4.8
Idle or fallow	13,588	14.7
Total crop land	93,065	100.0

The principal class of livestock kept by the 263 farmers is cattle, as is shown in Table No. 5.

Table No. 5. Total numbers of livestock kept by the 263 farmers in 9 sample areas in Southwestern North Dakota - 1936

Kind of livestock	Number of head	Animal Units	
		Number	Per cent
Cattle	6,434	4,825	80.36
Hogs - Brood sows	542	108	1.80
Other hogs	2,150	215	3.58
Sheep - Ewes	2,813	402	6.70
Others	2,107	301	5.01
Poultry - Laying hens	12,146	121	2.02
Others	3,218	32	0.53
Total	xxxxxxx	6,004	100.00

From the foregoing tables it is evident that the major sources of farm income in the area are wheat and cattle, as 50% of the total cultivated acreage is seeded to wheat and about 80% of the total animal units kept on the farms are cattle. This is probably as it should be, but it is quite generally agreed that the proportion of the income from wheat should be decreased and the income from cattle increased in order to conserve the natural resources of the area, and develop a more permanent and stabilized agriculture.

Present Size of Farm

There is considerable difference in size and organization of farms in the several areas. Figure Number 2 shows the present size of units, comparative acreage of cultivated and uncultivated land and number of animal units on the 263 farms surveyed in the nine sample areas. The horizontal bars to the right of the heavy black vertical line indicate the variation in the total acres operated. The light black, irregular line running through the horizontal bars shows the division of the total acres operated between cultivated land and native grass land. The horizontal bars to the left of the heavy black vertical line indicate the number of animal units of all classes of productive livestock (horses not included) kept by each of the farm operators.

The smallest farm found in the nine sample areas was 160 acres and the largest unit operated contained 3240 acres. The largest number of the farms are grouped around the 640 acre size. The acreage in crops varies considerably from farm to farm but shows a tendency to increase

somewhat with the increase in the size of the farm. The acreage in native grass land shows a pronounced increase with the increase in the size of the farm, as does the number of animal units, indicating a trend toward proportionately more livestock in relation to cash crops on the larger farms. The wide range in size of units is quite striking as shown on this chart and immediately raises the question of the economic feasibility of the smaller units. The probable income on these smaller farms under the prevailing physical and economic conditions is believed too meager to support the average family, especially when the present organization of these units is given consideration.

With this question in mind, the 263 farmers in the 9 sample areas were asked to indicate what type of farm they considered best adapted to the area and how much land was required to make a living for the average farm family on this type of farm. Chart No. 3 shows the minimum size of units mentioned by these operators in reply to this question. The replies indicate a wide variation of opinion, which may be due in some measure to variation in local conditions, a lack of understanding of the question or a poor estimation of the income which might be consistently earned on the smaller units mentioned. It might be stated here that the standard of living of many of the operators is very low, and undoubtedly the smaller sized units mentioned in these replies would, at best, afford only this very low standard of living for the average family.

FIGURE-2

PRESENT ORGANIZATION OF 263 FARMS IN NINE SAMPLE AREAS IN SOUTHWESTERN NORTH DAKOTA 1936

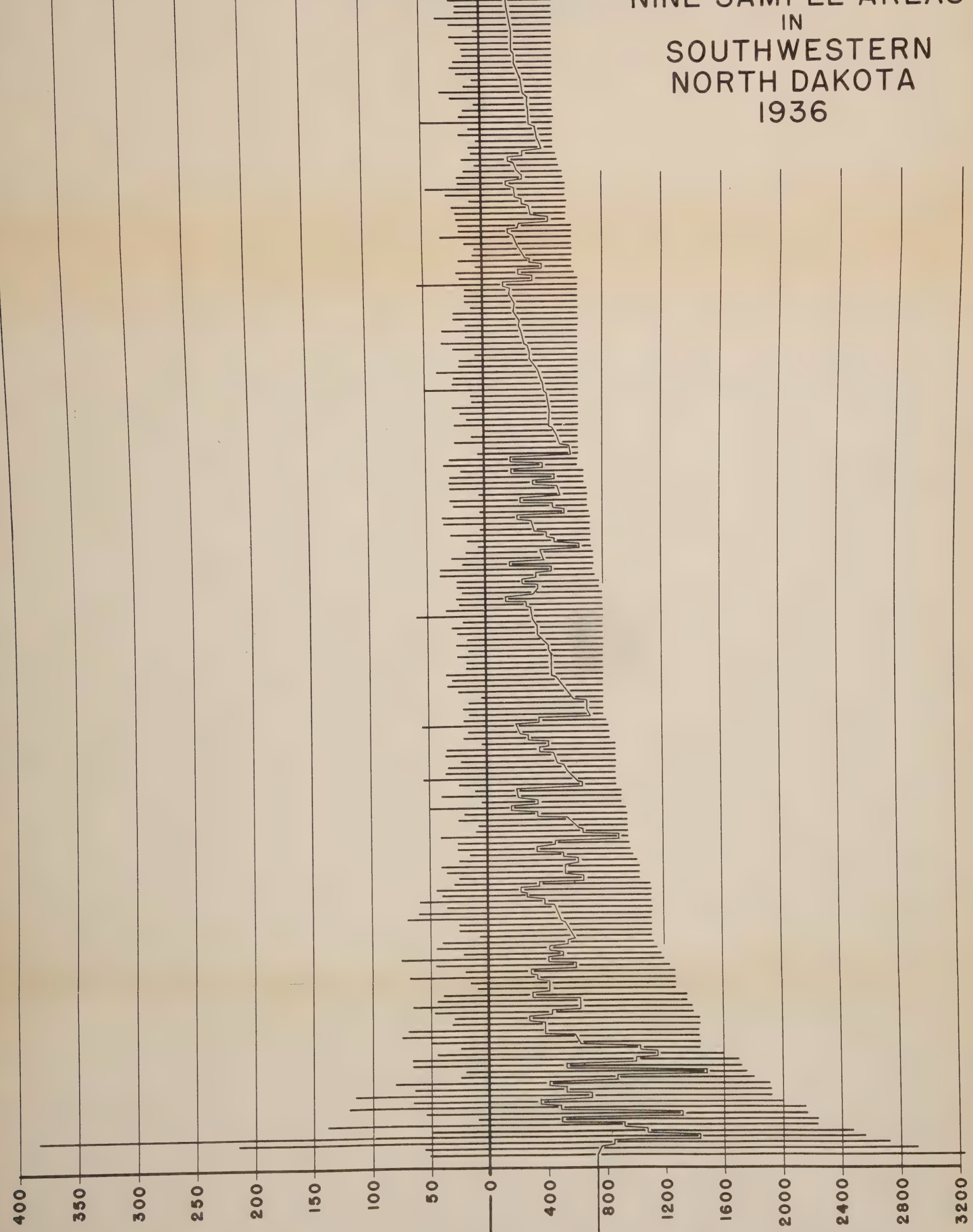

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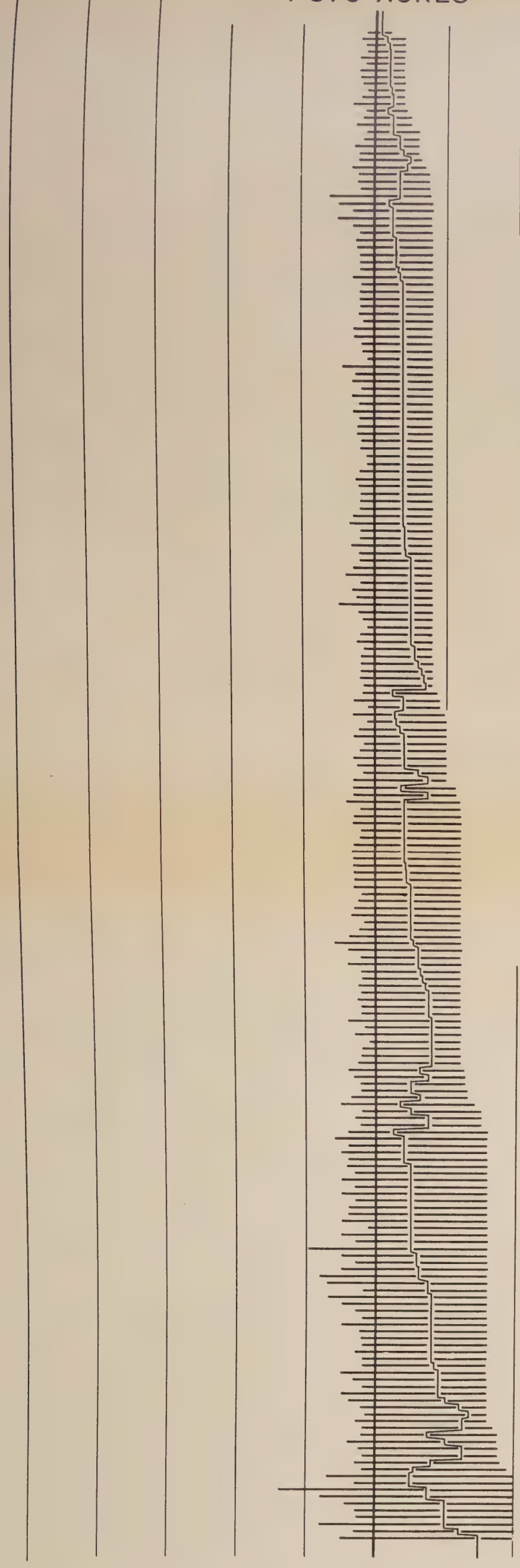
FIGURE 2

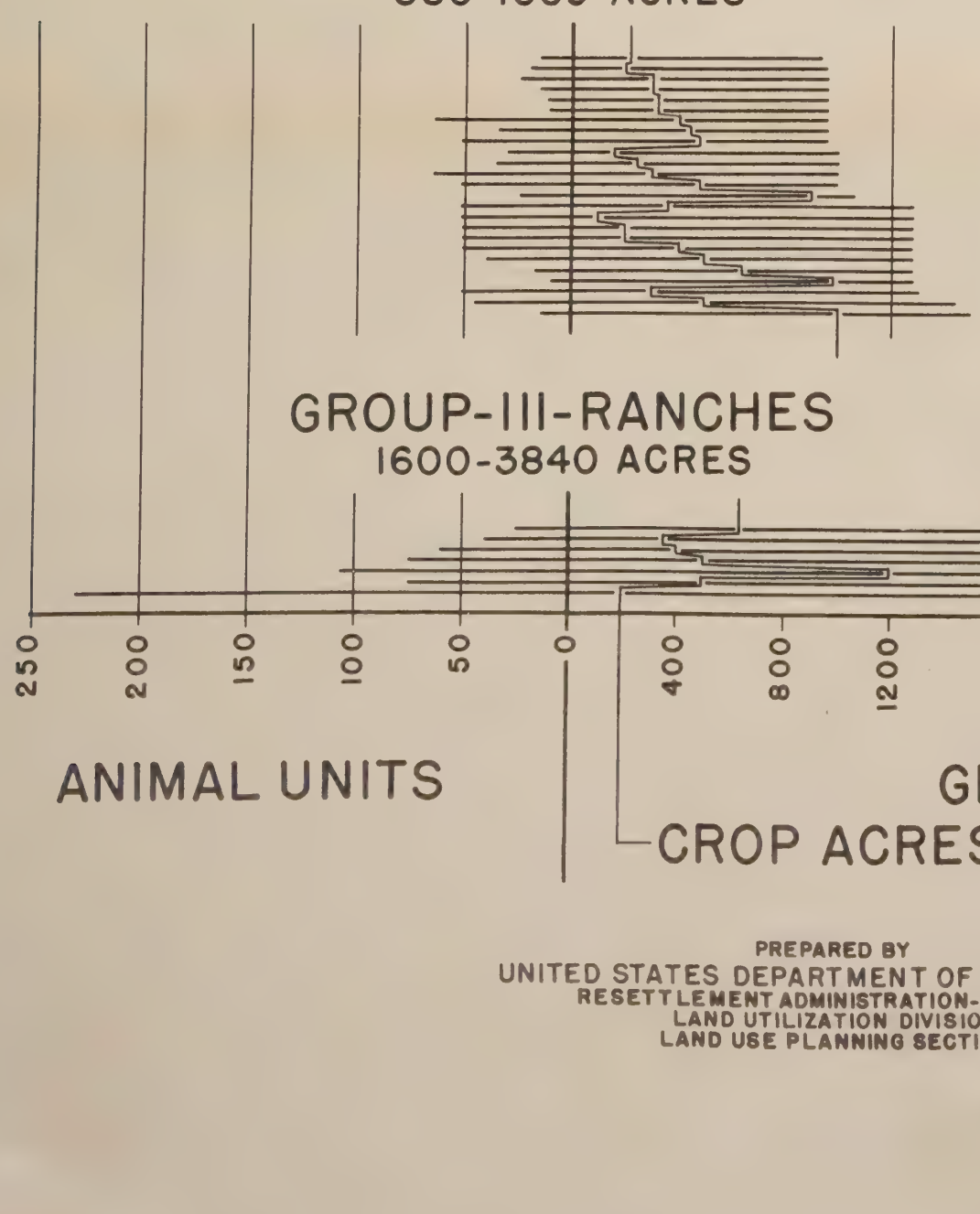
FIGURE-3

MINIMUM SIZE UNIT REQUIRED

TO SUPPORT
AN AVERAGE FARM FAMILY
IN
SOUTHWESTERN
NORTH DAKOTA

BASED UPON OPINION
OF
245 FARMERS
IN
9 SELECTED TOWNSHIPS
IN
THE MISSOURI SLOPE AREA
IN
NORTH DAKOTA
1936





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LAND USE PLANNING SECTION

FIGURE 3

The replies indicate that at least two types and sizes of units were considered suitable. First, a farm of about 480 to 640 acres and, second, a combination farm and ranch of about 1280 acres. One operator suggested a ranch type of about six sections.

In order to determine the relationship between size of operating unit and organization, income, living conditions, etc., schedules taken from the 263 farms studied were sorted into the several size groups shown in Table 6. This table shows that the 640-acre size group includes the greatest number of farms.

Table No. 6 Percent of total number of farms and total acreage operated by several size groups, and the relative amounts of cultivated and uncultivated land per farm, by size groups.

Size groups (acres)	No. of farms in group	% total no. farms in all groups	Total acreage operated	% acreage operated by all farms surveyed	Total cult. land operated by this size group: Acres	% total acreage operated	Total uncult. land operated by this size group: Acres	% total acreage operated
0- 240	15	5.7	2864	1.4	1962	68.5	902	31.5
241- 400	40	15.2	13610	6.8	6771	49.7	6839	50.3
401- 560	48	18.3	23511	11.6	11922	50.7	11589	42.0
561- 720	55	20.9	35567	17.6	18927	53.2	16640	46.8
721- 880	40	15.2	32335	16.1	16628	51.4	15707	48.6
881-1040	17	6.5	16680	8.3	8097	48.5	8583	51.5
1041-2080	39	14.8	53967	26.8	20898	39.0	33069	61.0
2081 and over	9	3.4	22830	11.3	7860	34.4	14970	65.6
All groups	263	100.0	201364	100.0	93065	46.2	108299	53.8

Figure No. 4 shows the percentage of the total number of farms in each sample area and in the nine areas combined that fall into the several size groups listed. There is considerable variation between the individual sample areas, the outstanding difference being the relatively large proportion (50%) of the farms in Area No. 7 that fall into the large size group, 1041 to 2080 acres. It is apparent that the combination farm-ranch type of organization is the prevailing type of farm in this sample area. However, for the nine areas combined, the greatest percentage of the farms are found in the 561 to 720 acre size group, which indicates that one section is the most prevalent size of farm in the Missouri Slope Area.

Figure No. 5 shows the percentage of the total farm acreage in each sample area and in the combined nine sample areas that is operated by each size group.

As in Figure No. 4, there is shown a wide variation between the several areas. For the combined nine sample areas, however, the 1041 to 2080 acre size group operates the greatest percentage of the total acreage in farms. It must be remembered, however, that this group includes a much greater (6 1/2 times as much) spread in acreage (1040 acres) than the preceding groups (160 acres).

Table No. 7 shows the average distribution of the acreage in various crops grown by the farmers, by size groups. There is a slight decrease in the relative amount of the cultivated land used for cash crops as the size of farm increases, but not enough decrease

FIGURE - 4

PERCENTAGE OF TOTAL NUMBER OF FARMS IN SEVERAL SIZE GROUPS IN 9 SAMPLE AREAS IN SOUTHWESTERN N. D. - 1936

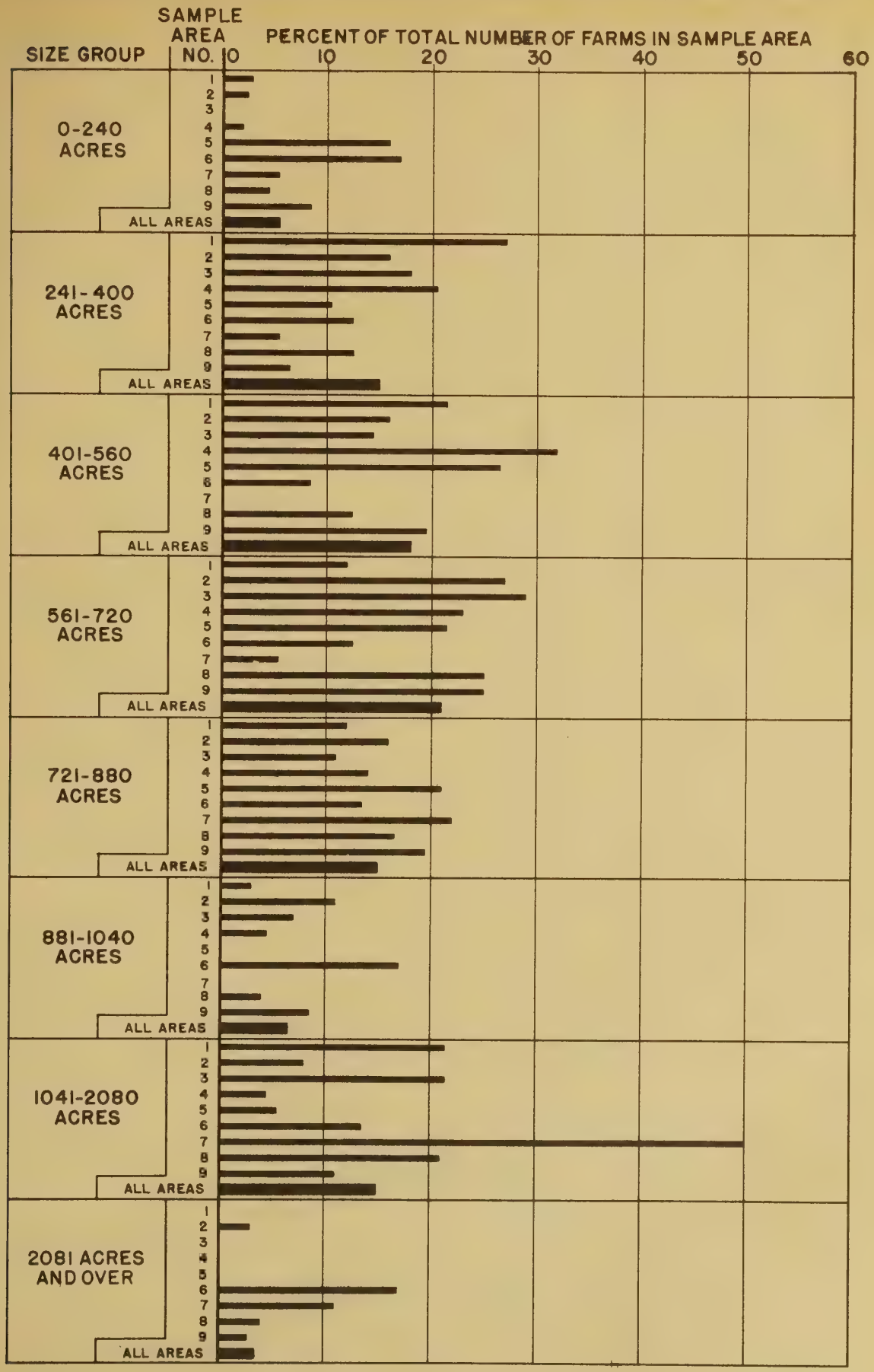

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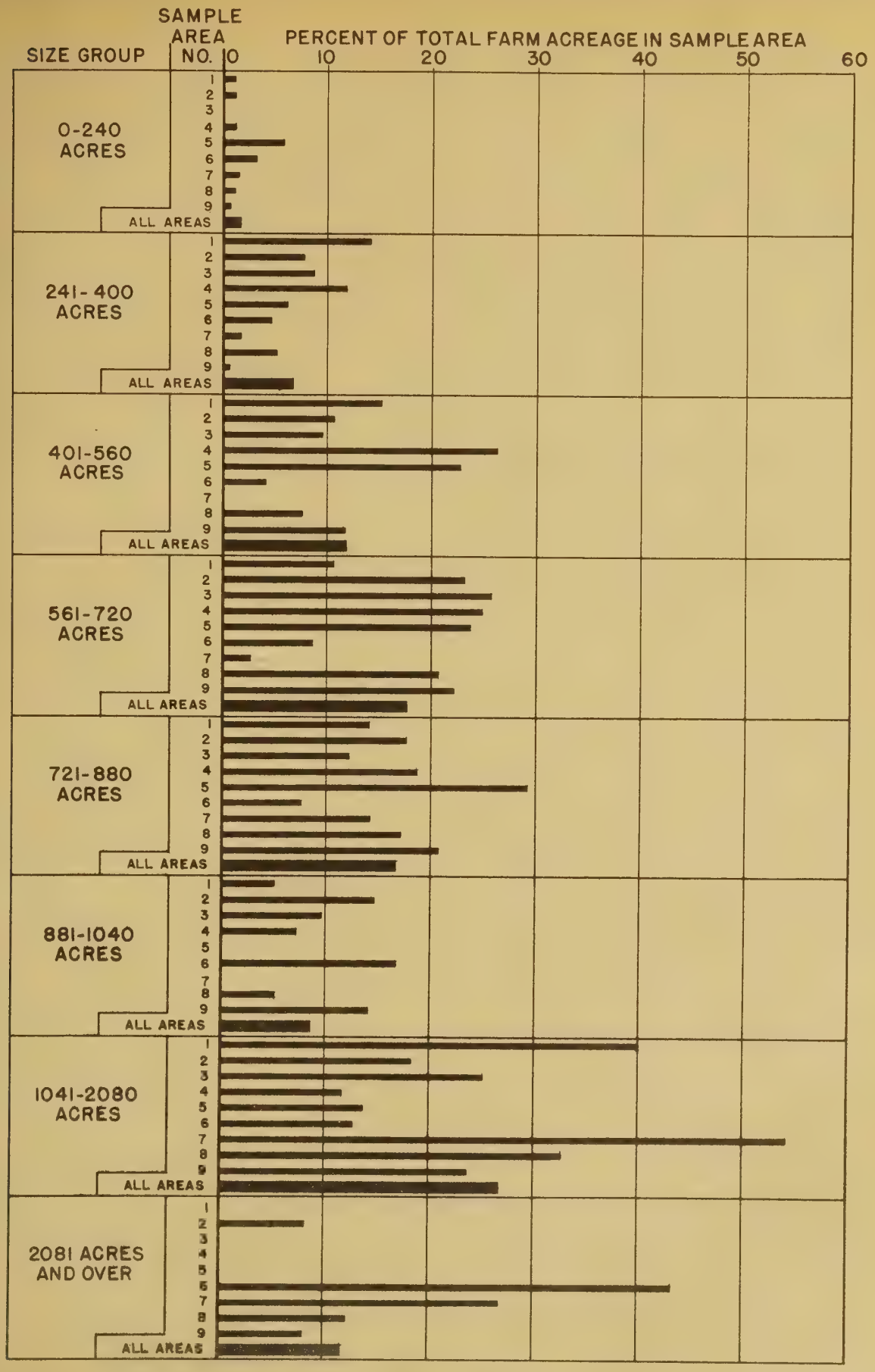
FIGURE - 5

PERCENTAGE OF TOTAL FARM ACREAGE IN 9 SAMPLE AREAS IN SOUTHWESTERN N.D. OPERATED BY VARIOUS SIZE GROUPS-1936



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to show the development of a strictly ranch organization on the larger farms. Table No. 6 shows the per cent of the cultivated acreage devoted to cash crops and feed grains by size groups. Figure No. 6 graphically portrays the tendency toward a larger percentage of grass land as the size of the unit increases, and Figure No. 7 shows the tendency of the operators of the larger units to use a slightly smaller percentage of their cultivated acreage for cash crops.

Table No. 9 and Figure No. 8 show the average numbers of the various classes of livestock kept by size groups. This table and figure show a tendency of the operators of the larger size units to diversify their farm operations by keeping more livestock. Consequently they are less dependent upon wheat for their income.

Table No. 10 and Figure No. 9 show the relationship of native hay and pasture land and feed crops to the number of animal units kept on the farms, by size groups. The number of acres per grazing animal unit of native hay and pasture land shows a decided increase as the size of the farm increases, while the acreage of feed grains per grazing animal unit decreases as the size of the farm increases. This would indicate that the farms in the smaller size groups either raise about half the feed needed for livestock on their cultivated land or else there is a tendency for the operators of the smaller units to overgraze the native grass land which they control. If the farmers were depending entirely upon their native grass land to carry their livestock, Figure No. 10 would graphically indicate the extent of

Table No. 7. Average distribution of acreage in various crops by size groups, 263 farms in southwestern North Dakota - 1936

Size Group (acres)	Number of farms in group	Average number of acres										
		Operated	Wheat	Flax	Rye	Feed Grain	Tame hay and pasture	Summer fallow and idle	Farmstead, waste, roads, etc.	Native hay and pasture	Tilled land	Untilled land
0 - 240	15	191	72	4	2	31	10	12	10	50	131	60
241 - 400	40	340	86	5	4	45	4	25	19	152	169	171
401 - 560	48	490	124	8	4	71	10	32	17	224	249	241
561 - 720	55	647	191	11	6	85	15	37	21	281	345	302
721 - 880	40	808	221	12	7	98	32	45	39	353	415	393
881 - 1040	17	981	242	19	4	106	11	93	17	487	476	505
1041 - 2080	39	1384	247	16	17	135	25	95	50	797	536	848
2081 and over	9	2537	378	0	37	217	51	191	7	1656	874	1663
ALL GROUPS	263	766	178	10	8	89	17	52	26	386	354	412

Table No. 8 Percentage distribution of land in farms in crop and grass land and percentage distribution of crop land in feed crops, cash crops, summer fallow and idle acreage by size groups, 263 farms in southwestern North Dakota - 1936

Size group (acres)	Number farms in group	Total area operated			Area under cultivation				
		Acres	% cultivated	% grass land	Acres	% cash crop*	% feed grain	% tame hay and pasture	% summer fallow and idle
0 - 240	15	191	68.5	31.5	131	59.5	23.7	7.6	9.2
241 - 400	40	340	49.7	50.2	169	56.2	26.6	2.4	14.8
401 - 560	48	490	50.7	49.3	249	54.6	28.5	4.0	12.9
561 - 720	55	647	53.2	46.8	345	60.3	24.7	4.3	10.7
721 - 880	40	808	51.4	48.6	415	57.8	23.6	7.7	10.9
881 - 1040	17	981	48.5	51.5	476	55.8	22.3	2.3	19.6
1041 - 2080	39	1384	39.0	61.0	536	52.2	25.2	4.7	17.7
2081 and over	9	2537	34.4	65.6	874	47.5	24.8	5.8	21.9
ALL GROUPS	263	766	46.2	53.8	354	55.4	25.1	4.8	14.7

*Includes wheat, flax and rye.

FIG. 6 – RELATIONSHIP OF PERCENTAGE OF LAND UNDER CULTIVATION AND SIZE OF FARMS, 1936 BASED ON A STUDY OF 263 FARMS IN SOUTH-WESTERN NORTH DAK.

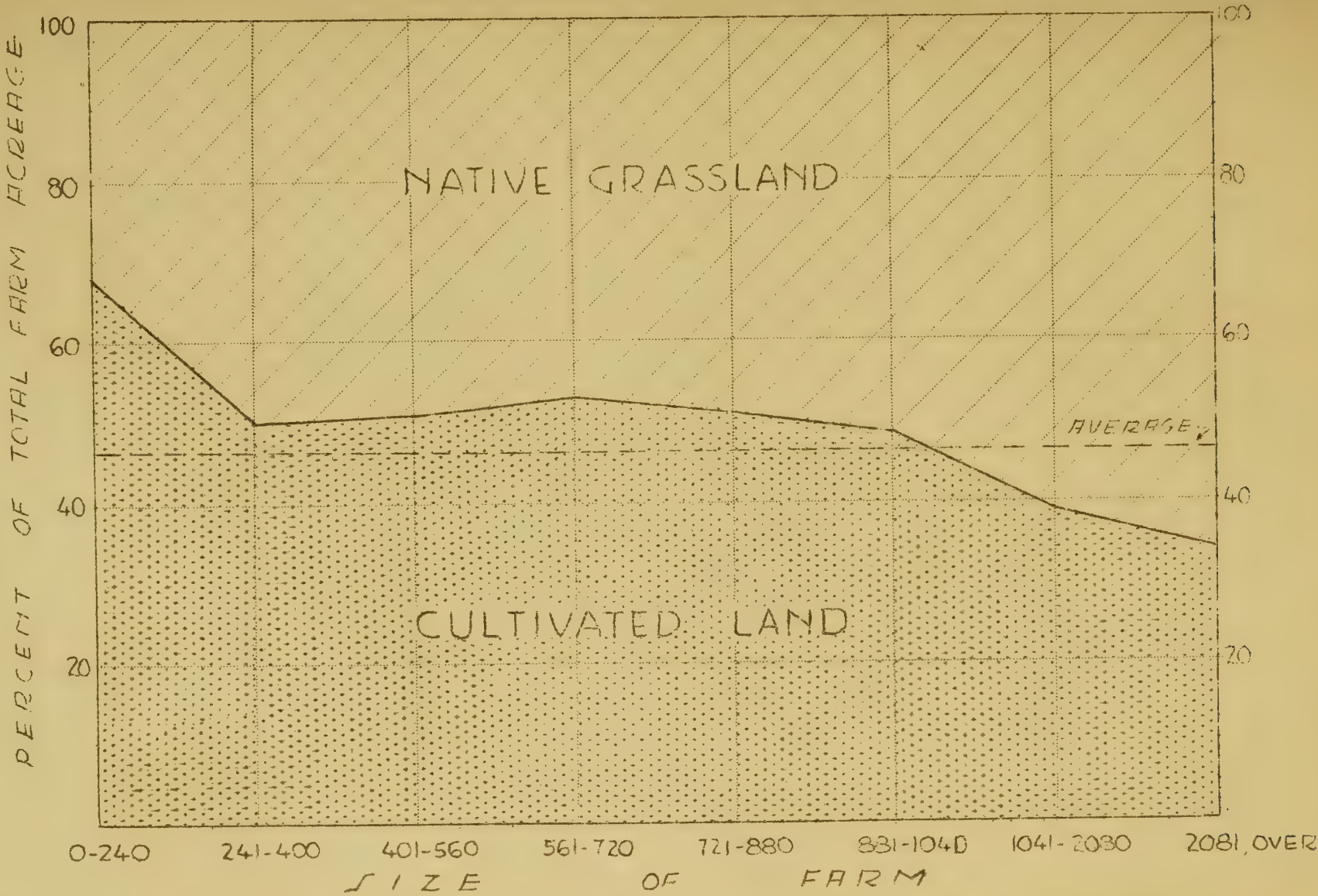

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FIG. 7 — RELATIONSHIP OF DISTRIBUTION OF CULTIVATED ACREAGE AND SIZE OF FARM, 1936 BASED ON A STUDY OF 263 FARMS IN SOUTHWESTERN N. DAK.

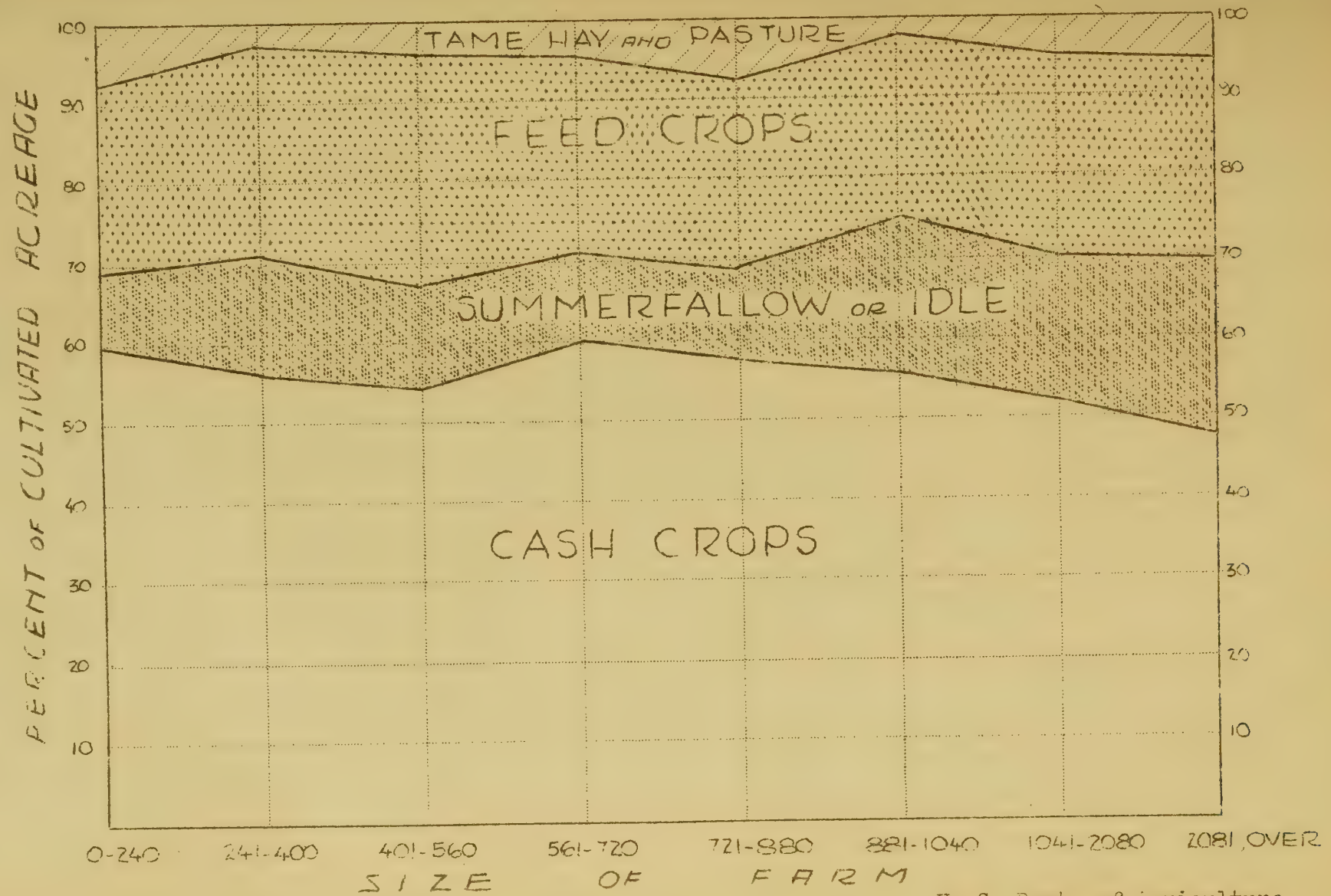

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Table No. 9 Livestock numbers per farm by size groups, 263 farms in southwestern North Dakota - 1936

Size group (acres)	Number of farms in group	Average number of									
		Milk cows	Beef cows and other cattle	Sows	Other hogs	Ewes	Other sheep	Laying hens	Other poultry	Total A.U.	Grazing A.U.
0 - 240	15	3	3	0	2	0	0	33	6	6	6
241 - 400	40	6	6	1	3	5	0	33	10	12	11
401 - 560	48	8	11	2	7	1	1	49	13	19	17
561 - 720	55	10	12	2	8	1	1	45	9	21	19
721 - 880	40	10	17	2	10	6	6	55	5	26	24
881 - 1040	17	10	16	2	8	2	2	63	6	24	22
1041 - 2080	39	10	39	3	14	12	9	48	18	44	42
2081 and over	9	12	26	3	19	197	153	42	69	89	86
ALL GROUPS	263	8	16	2	8	11	8	46	12	25	23

Table No. 10 Average acreage of native hay and pasture and feed crops per grazing animal unit by size groups, 263 farms in southwestern North Dakota - 1936

Size group (acres)	Number of farms in group	Average number of grazing A.U.	Average acreage of native hay and pasture	Average acreage of native hay and pasture per grazing animal unit	Average acreage feed grain tame hay and pasture	Average acreage of feed grains tame hay & pasture per grazing animal unit	Average acreage of all feed crops and pasture per grazing animal unit
0 - 240	15	6	50	9.1	41	7.5	16.6
241 - 400	40	11	152	13.8	49	4.5	18.3
401 - 560	48	17	224	13.1	81	4.7	17.8
561 - 720	55	19	281	14.7	100	5.2	19.9
721 - 880	40	24	353	14.7	130	5.4	20.1
881 - 1040	17	22	487	21.6	117	5.2	26.7
1041 - 2080	39	42	797	19.1	160	3.8	22.9
2081 and over	9	86	1656	19.3	268	3.1	22.4
ALL GROUPS	263	23	386	16.6	106	4.5	21.1

FIG. 8 – LIVESTOCK NUMBERS PER FARM BY SIZE GROUPS, 1936

BASED ON A STUDY OF 263 FARMS IN SOUTHWESTERN NORTH DAKOTA

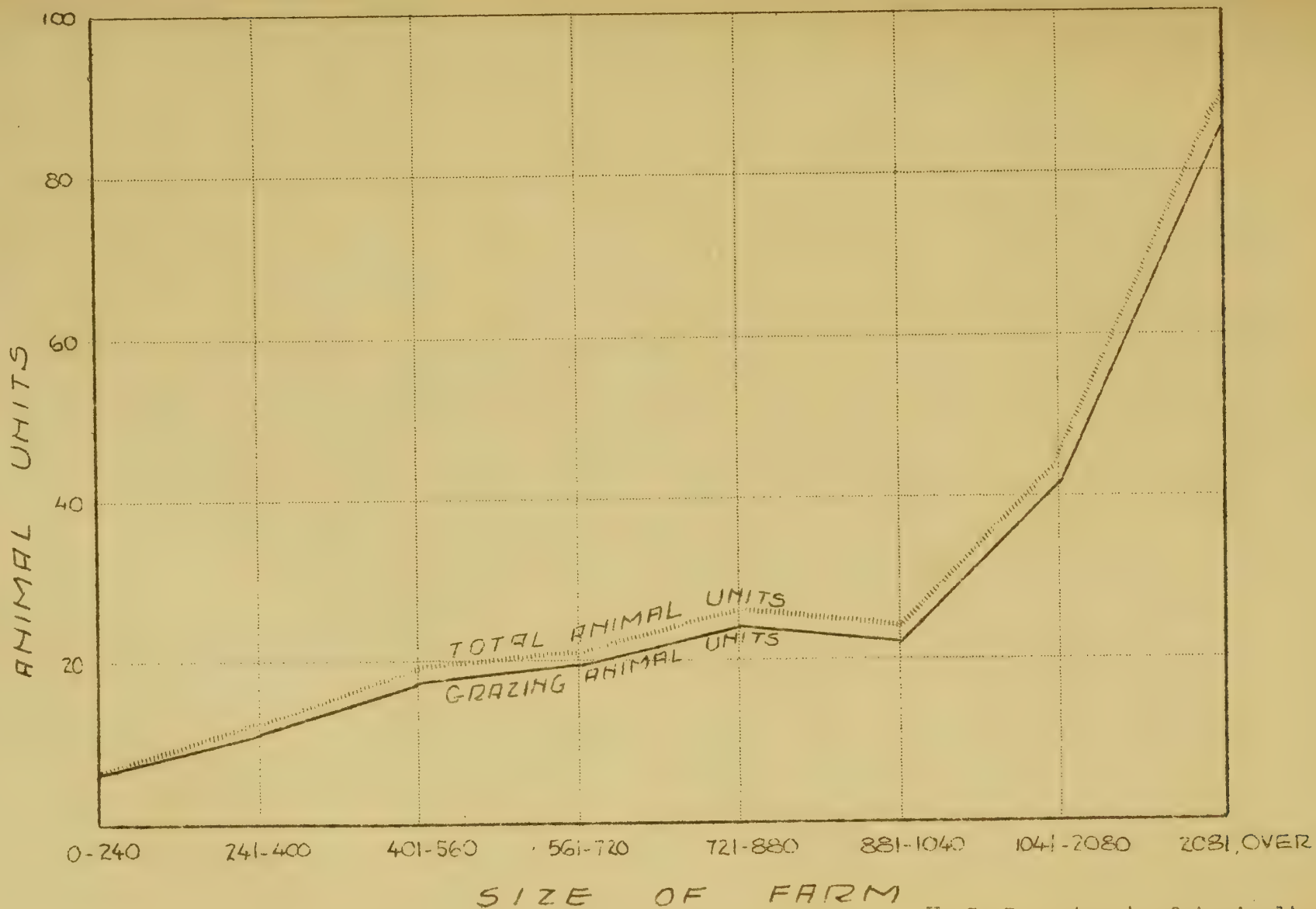

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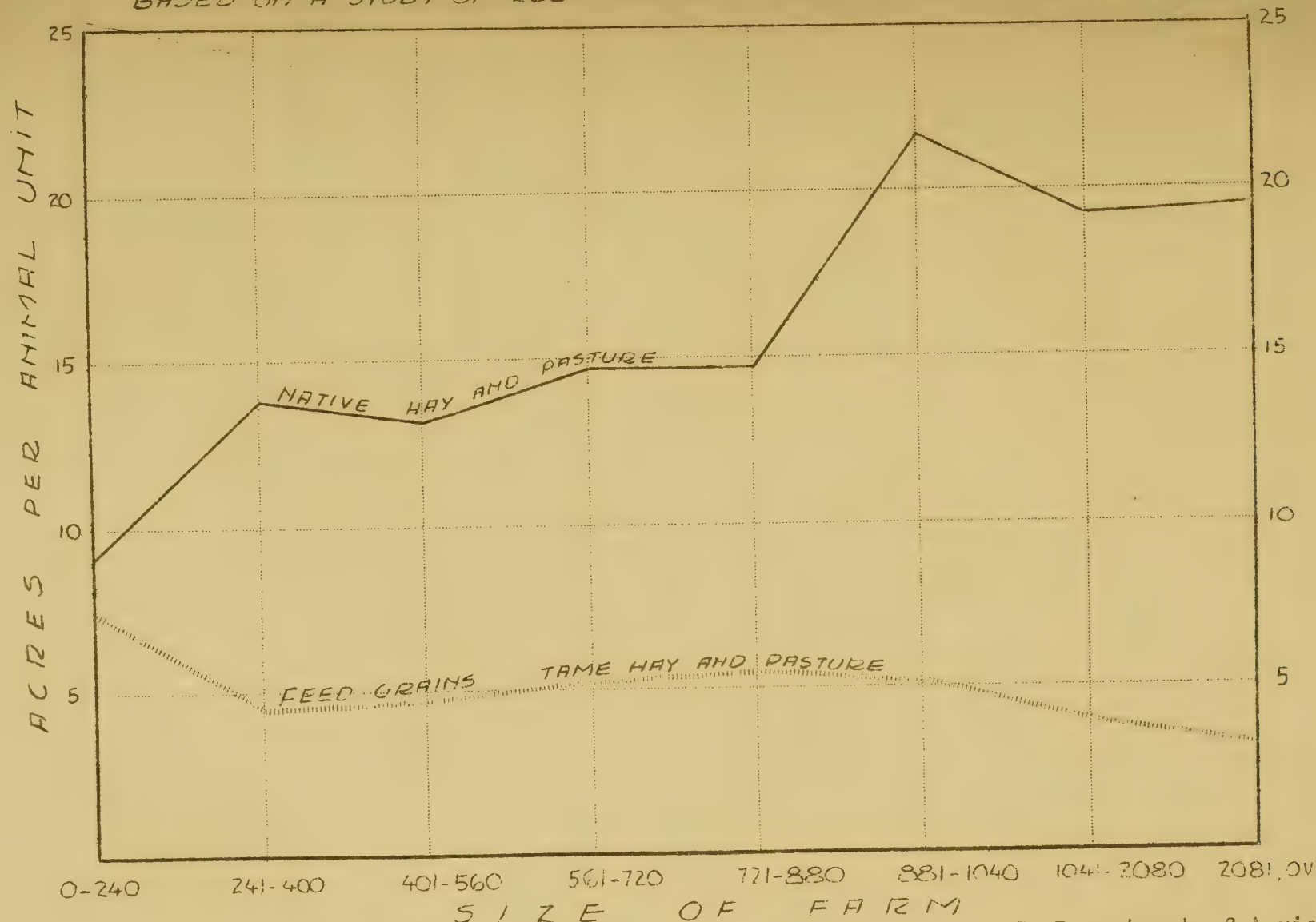
FIG. 9 — RELATIONSHIP OF ACRES OF GRASSLAND FEED CROPS PER ANIMAL UNIT AND SIZE OF FARM, 1930

BASED ON A STUDY OF 263 FARMS IN SOUTHWESTERN NORTH DAKOTA



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overgrazing, by size groups. It is reasonable to believe that the tendency on the smaller units to overgraze the native grass land to a greater degree than on the larger units is roughly indicated by Figure No. 10, but since no allowance has been made for tame pasture in the preparation of this chart, the exact amount of overgrazing can not be determined or accurately charted from the information available. Native grass land furnishes practically all of the grazing in the Missouri Slope Area, however, and the tame pasture which might be available would not affect the trend shown on this chart to any great extent.

The present standard of living of the farmers as well as other sociological data in relation to the size of farm is shown in Table No. 11. There is a tendency for the number of years on the farm to increase with the size of the farm. There also appears to be a slight tendency for the average age of the operator to increase as the size of the farm increases, although this is not very consistent. The size of the family definitely increases with the increase in the size of farm, as does the number of man months of labor hired. Apparently the size of the farm has no pronounced relationship to the education given to the farm children, although the largest size group shows a decided increase over the other groups in the number of years of education above the eighth grade given to the farm children.

The number of rooms per dwelling increases consistently with the increase in the size of the farm. The percentage of the farmers

FIG. 10 — RELATIONSHIP of ANIMAL UNITS CARRIED PER QUARTER-SECTION of GRASS LAND TO SIZE OF FARM - 1936

BASED ON A STUDY OF 263 FARMS IN SOUTHWESTERN NORTH DAKOTA

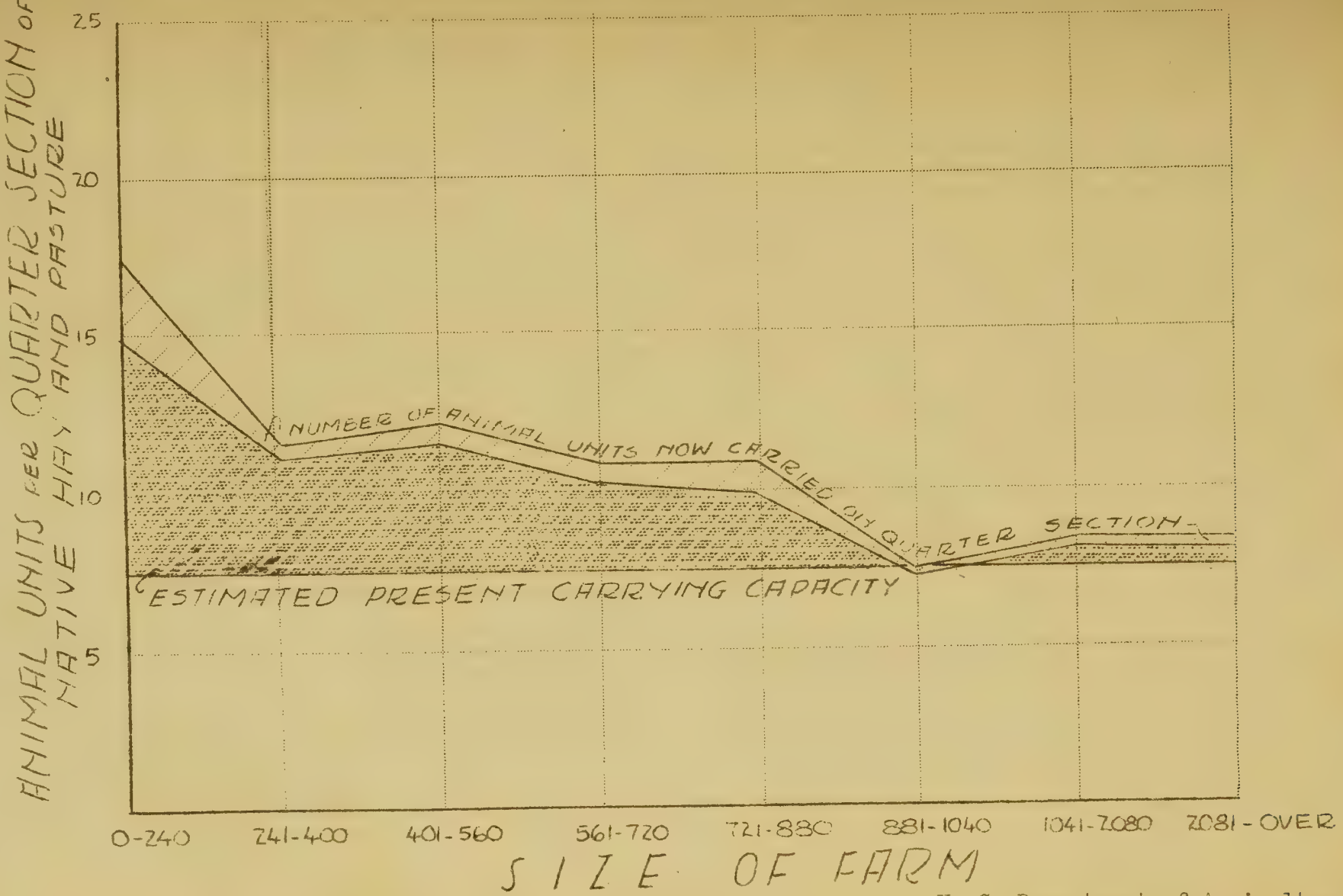

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Table No. 11 Sociological Data Indicative of Standard of Living by Size Groups - 263 Farms in Southwestern North Dakota - 1936

Size group (acres)	0-240	241-400	401-560	561-720	721-880	881-1040	1041-2080	2081 and over	All groups
Number of farms in group	15	40	48	55	40	17	39	9	263
Average age of operator (years)	46	38	46	46	49	45	51	47	46
Number of years on present farm	16	10	16	15	18	19	21	21	16
Number in the family	5	5	6	6	7	8	7	8	6
Number of children at home	2	2	3	3	4	4	4	4	3
Number of man-months labor hired	4.0	1.6	1.4	4.9	4.1	3.9	6.3	10.6	4.4
Present size of family	4	4	5	5	5	6	5	6	5
Total years education above 8th grade - all children	5.5	11.0	3.6	2.9	6.3	6.1	5.0	19.0	5.3
Total years education head of family	7.5	7.1	6.5	5.8	6.5	7.4	6.9	9.2	6.7
Total years education other adults in family	7.5	7.7	7.3	7.4	7.8	8.9	8.3	7.9	7.7
Number of rooms in dwelling	3	5	5	5	6	6	6	6	5.4
Per cent of farms having radios	40	77	71	71	82	57	75	78	72
Per cent of farms having bath and running water	0	0	9	15	11	0	11	33	10
Per cent of farms having telephone	40	23	59	68	39	31	50	56	50
Per cent of farms having gas or electric lights	0	0	15	35	18	31	29	22	22
Average value of automobile	$ 56	$ 63	$171	$229	$199	$196	$216	$400	$200
Average annual gain or loss in net worth	-$ 17	$ 4	$141	$112	$138	$106	$107	$479	$129
Distance to school	2.0	1.4	2.0	1.5	1.3	1.7	2.0	2.6	1.7
Distance to market	9.4	8.1	7.8	8.0	9.5	10.8	8.4	12.1	8.8

having radios remains about the same regardless of the size of farm operated, except for the very smallest size group. The percentage of the farms having running water or bath and gas or electric lights shows some tendency to increase as the size of the farm increases. The fact that none of the 55 farms in the two smallest size groups have these conveniences appears significant.

The average annual gain in net worth shows a decided increase with the increase in the size of the farm as does also the average value of the operator's automobile. There is apparently little relationship between the size of the farm and the distance to school or market. The largest size group is considerably farther from market than the other groups, which may be an indication that the larger farms approaching the ranch type of organization are usually located a greater distance from market than the other smaller size units.

Table No. 12 shows the percentage of the farms having various items of equipment, by size groups. It is evident that the smaller size farms have only that machinery and equipment which is absolutely necessary to operate, often borrowing some of the necessary equipment from the neighbors operating larger units.

Table No. 13 shows the relationship between the rural population and the land, by size groups of farms. On the 55 farms included in the two smallest size groups 16.6% of the people live on 8.2% of the land. The percentage of the people and the percentage of the land do not balance until the 721 to 880 acre size group is reached

Table 12. Percentage of farms having various items of machinery and equipment, by size groups, 9 sample areas, southwestern North Dakota - 1936

Size group	Under 240 acres	240 to 399	400 to 559	560 to 719	720 to 879	880 to 1039	1040 to 2079	2080 and over	Average all size groups
No. of farms in group	9	38	48	55	39	22	40	9	260
Items of machinery and equipment									
Corn planter	44	18	35	40	51	50	65	78	44
Lister	11	0	2	2	0	0	8	0	2
Corn binder	11	3	29	25	38	27	58	33	30
Ensilage cutter	11	0	0	4	5	0	8	11	3
Corn picker	0	0	0	0	0	9	2	0	1
Corn sheller	0	0	4	0	3	0	0	0	1
Cultivators	67	66	92	98	100	100	100	100	92
Drill	100	87	92	100	100	100	100	100	97
Endgate seeder	11	0	2	0	0	0	0	0	1
Binder	89	55	75	84	92	100	100	100	84
Combine	0	3	4	5	18	14	15	33	10
Separator	22	0	17	18	26	50	42	44	24
Header	11	26	21	36	36	36	42	33	32
Elevator	0	0	0	9	13	14	22	11	9
Mower	89	84	94	98	100	100	100	100	96
Rake	89	68	83	93	92	91	100	100	88
Loader	0	3	0	0	0	5	0	0	1
Sweep rake	0	0	0	0	5	5	0	0	1
Stacker	0	0	0	2	3	5	2	22	2
Tractor	22	29	62	62	69	77	100	89	65
Truck	44	11	35	38	38	36	58	89	38
Auto	56	76	88	96	100	91	100	100	93
Wagon	100	100	100	100	100	100	100	100	100
Engines	100	29	42	56	69	64	60	56	54
Tractor plow	11	18	42	44	62	50	50	78	44
Other plows	100	89	100	100	100	100	100	100	98
Disc	100	66	88	93	100	100	100	100	91
Drag or harrow	100	76	85	96	97	100	100	100	93
Cream separator	33	82	79	93	87	86	82	78	83
Feed grinder	22	16	38	40	62	73	68	78	47
Manure spreader	11	3	6	7	18	27	35	44	15

where 16.2% of the people live on 16.1% of the land. Of course, the average quality of the land perhaps averages somewhat poorer on the larger farms, but it is evident that there is a crowding of the population on the land that is included in the smaller farms which is all out of proportion to whatever advantage these smaller farms may have in better quality of soil. As a result, human and economic distress is concentrated on these smaller units. It might be stated here that analysis of the soils data obtained in five of the nine sample areas failed to show any marked relationship between the quality of soil and size of unit.

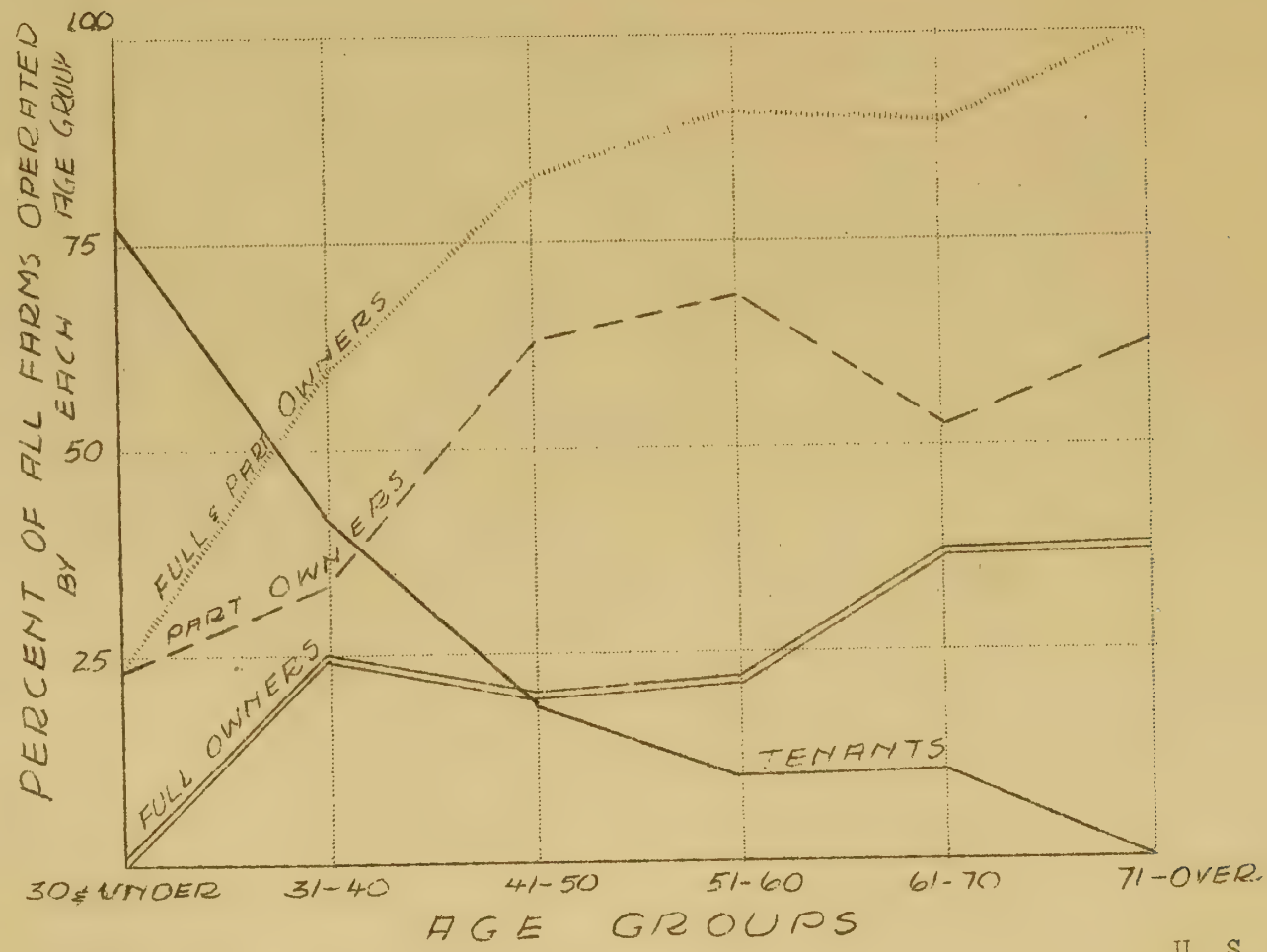
It is interesting to note the relationship of age of operators to the type of tenure. This relationship is shown in Table No. 14 and Figure No. 11. Apparently it was possible to climb the "agricultural ladder", at least until the recent years. The percentage of operators who are tenants definitely decreases as the age increases, and the percentage of operators who are owners or part owners shows a corresponding increase as the age increases. It is possible that the last few unfavorable years may have wiped out much of the equity which the so-called "owners" have in their farms, but there seems to be a rather definite and striking relationship between the age of the operator and type of tenure.

Table No. 13. Relationship between the population and the land in nine sample areas in southwestern North Dakota, by size groups - 1936

Size group (acres)	Farms in group		Land operated		Land under cultivation		Persons on farms		Total acres operated per person	Cultivated acres per person	Cumulative per cent		
	No.	%	Acres	%	Acres	%	No.	%			Total acres operated	Total cultivated acreage	Total no. of persons
0 - 240	15	5.7	2,864	1.4	1,962	2.1	46	3.7	62	43	1.4	2.1	3.7
241 - 400	40	15.2	13,610	6.8	6,771	7.3	160	12.9	85	52	8.2	9.4	16.6
401 - 560	48	18.3	23,511	11.6	11,922	12.8	220	17.8	107	54	19.9	22.2	34.4
561 - 720	55	20.9	35,567	17.6	18,927	20.3	248	20.0	143	76	37.5	42.5	54.4
721 - 880	40	15.2	32,335	16.1	16,628	17.9	201	16.2	161	83	53.6	60.4	70.6
881 - 1040	17	6.5	16,680	8.3	8,097	8.7	109	8.8	153	74	61.9	69.1	79.4
1041 - 2080	39	14.8	53,967	26.8	20,898	22.5	200	16.1	270	104	88.7	91.6	95.5
2081 and over	9	3.4	22,830	11.3	7,860	8.4	56	4.5	408	140	100.0	100.0	100.0
ALL GROUPS	263	100	201,364	100	93,065	100	1,240	100	162	75	100.0	100.0	100.0

FIG. 11 — TREND IN TENURE BY AGE GROUPS, 1936

BASED ON STUDY OF 257 FARMS IN SOUTHWESTERN NORTH DAKOTA



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"owners" have in their farms, but there seems to be a rather definite and striking relationship between the age of the operator and type of tenure.

Table No. 14 Relationship of Age of Operator to Type of Tenure, 257 Farms in Southwestern North Dakota-1936

Age group	Full owners		Part owners		Tenants		Total	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
30 and under	0	0	7	23	24	77	31	100
30 - 40	14	25	18	33	23	42	55	100
41 - 50	16	20	48	62	14	18	78	100
51 - 60	11	22	34	68	5	10	50	100
61 - 70	13	37	18	52	4	11	35	100
71 and over	3	38	5	62	0	0	8	100
All ages	57	22	130	51	70	27	257	100

Table No. 15 shows the acreage of land in various ownerships classes in the nine sample areas. This data was taken from the material assembled by W. P. A. Project No. 65-73-2363 which is directed by C. H. Plath, State Land Planning Specialist for North Dakota. There is considerable variation between the several areas, especially in the amount of non-resident owned land.

Table No. 15. Classification of land ownership, nine sample areas, North Dakota

Sample Area Number	Resident private		Non-resident private*		Total private		Corporation		Tax exempt		Total township	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
5	18,084	78.6	1,825	7.9	19,909	86.5	162	.7	2,922	12.7	22,993	100.0
3	19,211	83.5	880	3.8	20,091	87.3	316	1.3	2,599	11.2	23,006	100.0
2	21,447	93.6	160	.7	21,607	94.3	80	.3	1,283	5.5	22,970	100.0
4	20,322	88.7	1,280	5.5	21,602	94.2	5	-	1,303	5.6	22,910	100.0
1	16,684	72.4	76	.3	16,760	72.7	3,304	14.3	2,964	12.8	23,028	100.0
9	17,841	77.6	2,874	12.5	20,715	90.1	320	1.3	1,920	8.3	22,955	100.0
6	7,875	34.1	8,516	36.8	16,391	70.9	4,422	19.1	2,291	9.9	23,104	100.0
7	11,723	50.8	8,615	37.4	20,338	88.2	775	3.3	1,920	8.3	23,033	100.0
8	12,587	54.6	9,085	39.4	21,672	94.0	480	2.0	888	3.8	23,040	100.0
Totals	145,774	70.4	33,311	16.0	179,085	86.4	9,864	4.7	18,090	8.7	207,039	100.0

* "Non-resident" ownerships used here include all land owned by individuals whose postoffice address as listed on the county records is over 50 miles from the tract of land owned.

The type of ownership in relationship to the operating unit pattern is shown for each of the nine sample areas in Figures No. 12 to 20 inclusive.

The number of ownerships per operating unit for the nine sample areas is shown in Table No. 16. The number of ownerships varies from 1 to as high as 9 per unit, but on only 5.3% of the total number of farms do the number of ownerships exceed 4. The average number of ownerships per unit is 2.36, and on 167 of the 262 units (or 63.7%) there are two or less ownerships per operating unit. In other words, the number of ownerships per operating unit does not present a very serious problem except on some of the larger farms and ranches and these comprise a relatively small percentage of the total number of farms. The number of ownerships per operating unit is shown mapped in place for each of the 9 sample areas in Figures No. 21 to 29, inclusive.

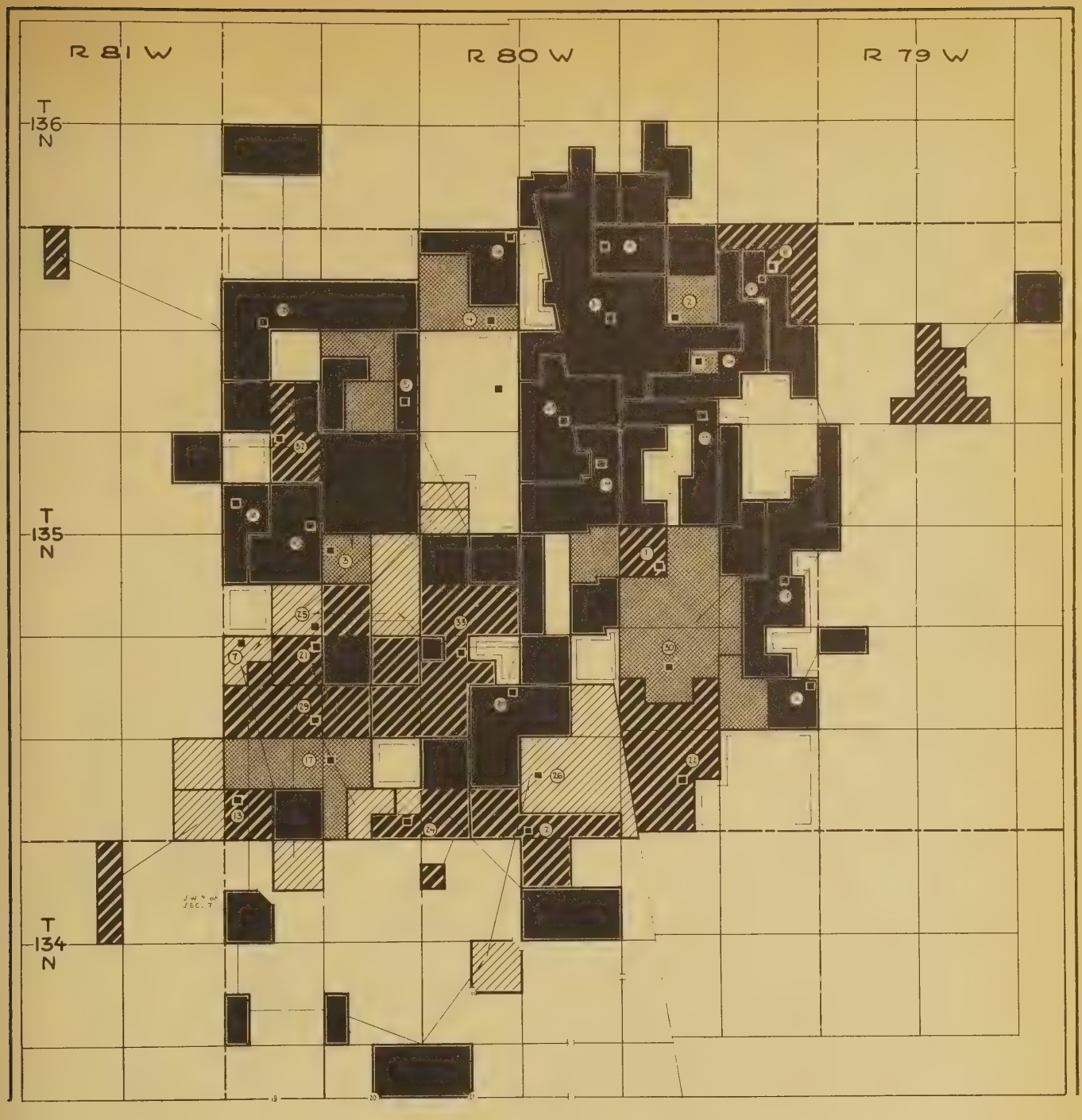

FIGURE - 12

TYPE OF OWNERSHIP AND RELATIONSHIP TO OPERATING UNIT PATTERN

BASED ON STUDY OF 33 FARMS IN T. 135 N. R. 80 W.
1936 MORTON COUNTY — NORTH DAKOTA 1936
SAMPLE AREA NO. 1

LEGEND

- OWNER OPERATED
- OTHER PRIVATELY OWNED
- CORPORATE OWNED
- PUBLICLY OWNED LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATORS HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5

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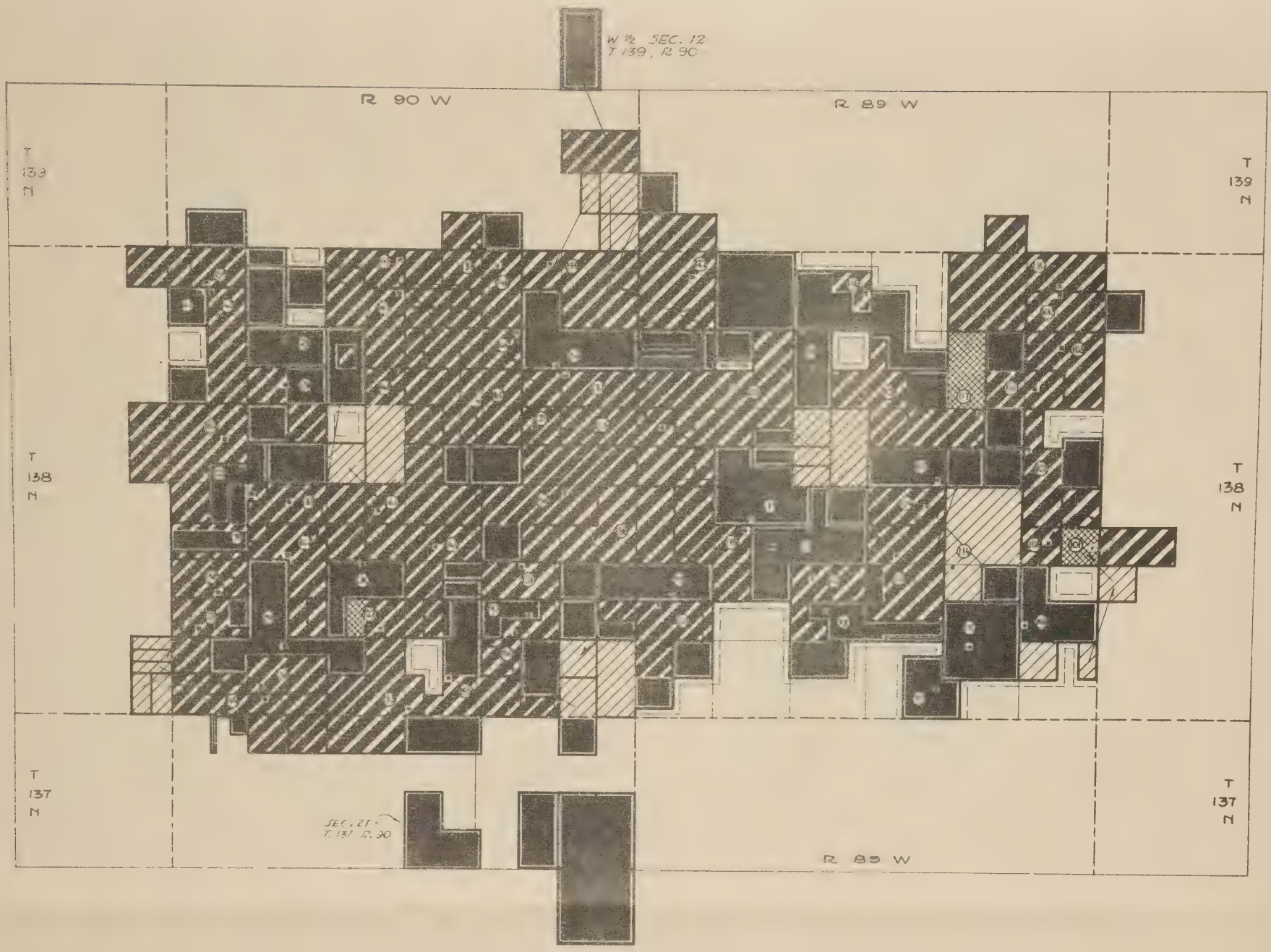

FIGURES - 13 & 14

TYPE OF OWNERSHIP
AND
RELATIONSHIP TO OPERATING UNIT PATTERN

BASED ON STUDY OF 65 FARMS IN TWO TOWNSHIPS -
1936 T. 138 N. R. 89 AND 90 W. MORTON COUNTY-NORTH DAKOTA 1936
SAMPLE AREAS - 2 AND 3

LEGEND

- OWNER OPERATED
- OTHER PRIVATELY OWNED
- CORPORATE OWNED
- PUBLICLY OWNED LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HDQTS.
- SECTION LINE
- TOWNSHIP LINE
- 211 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES
0 1 2 3 4 5 6

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LAND USE PLANNING SECTION

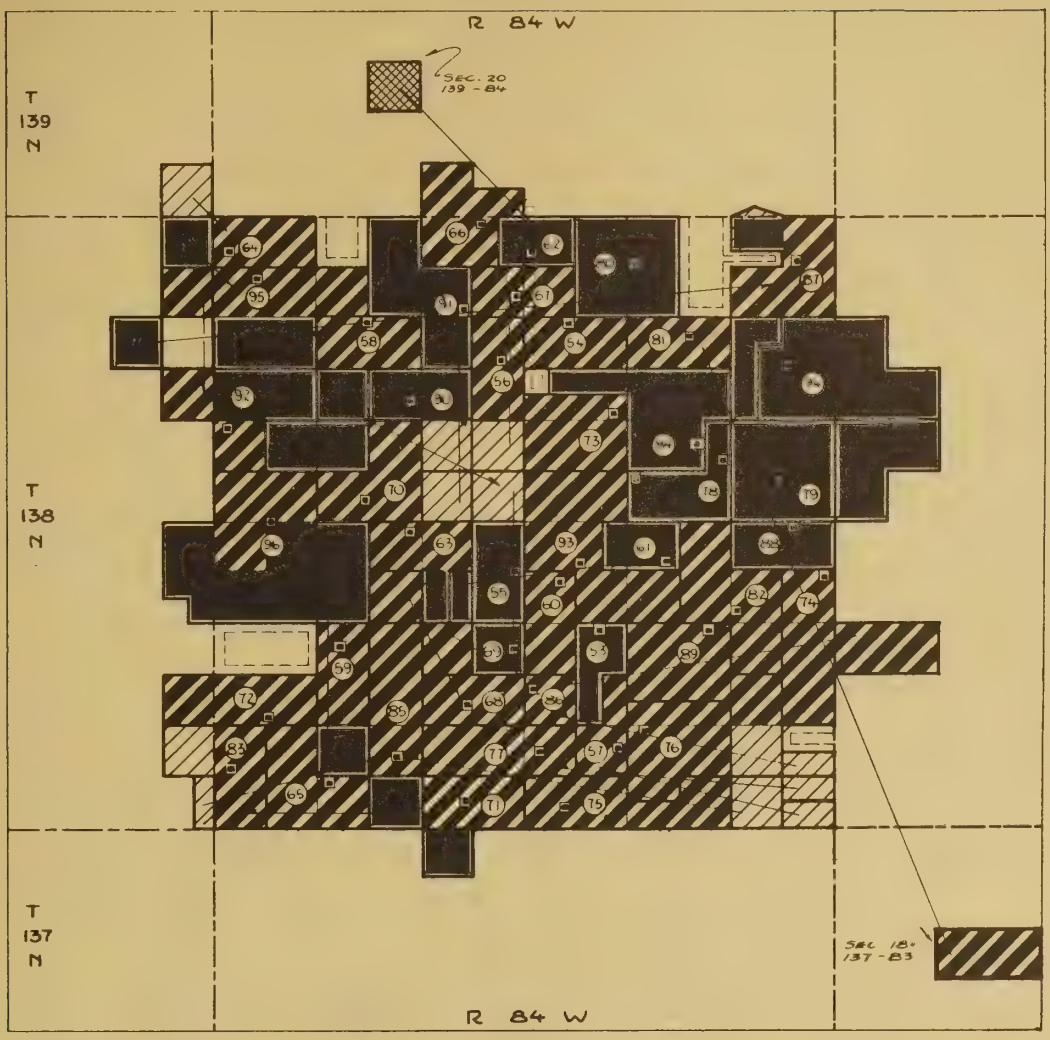

FIGURE-15
TYPE OF OWNERSHIP
AND
RELATIONSHIP TO OPERATING UNIT PATTERN

BASED ON STUDY OF 44 FARMS IN T.138N. R.84W
1936 MORTON COUNTY-NORTH DAKOTA 1936
SAMPLE AREA NO. 4

LEGEND

- OWNER OPERATED
- OTHER PRIVATELY OWNED
- CORPORATE OWNED
- PUBLICLY OWNED LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- 211 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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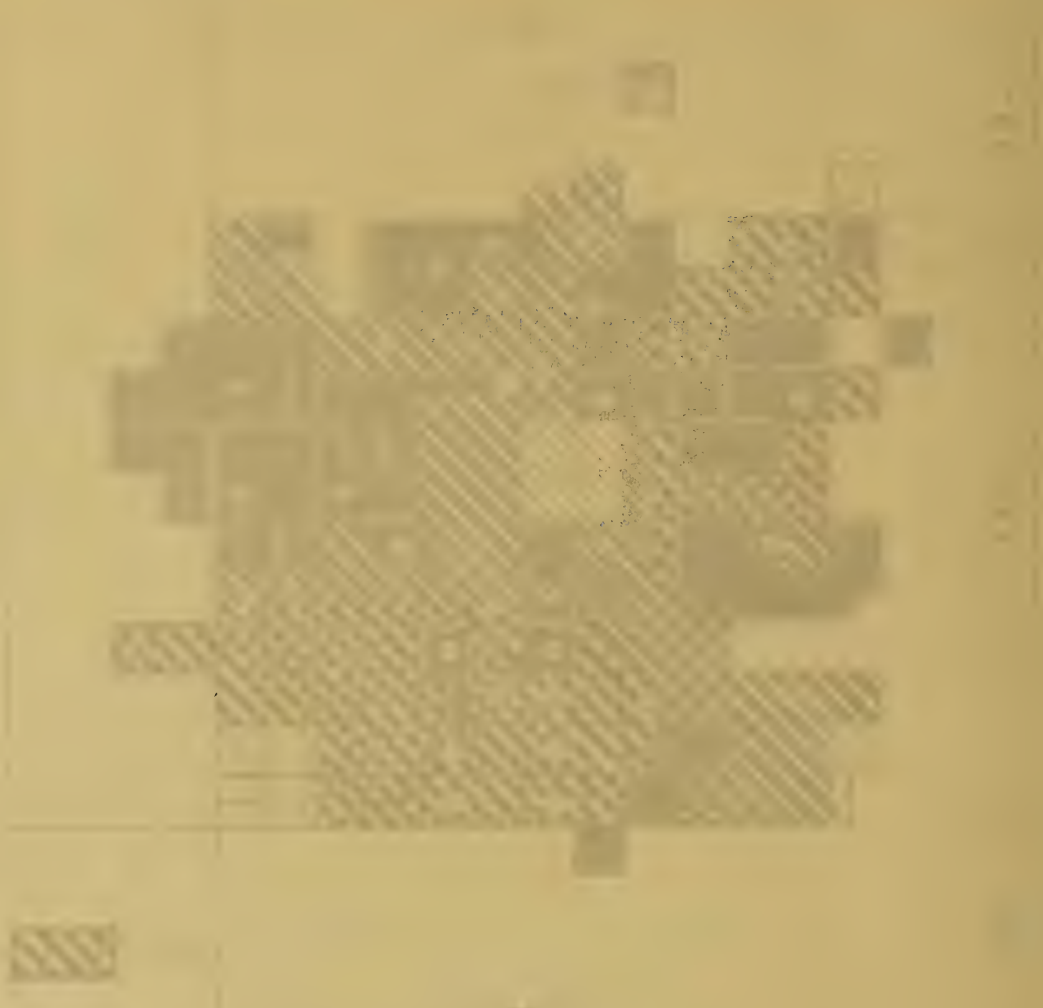

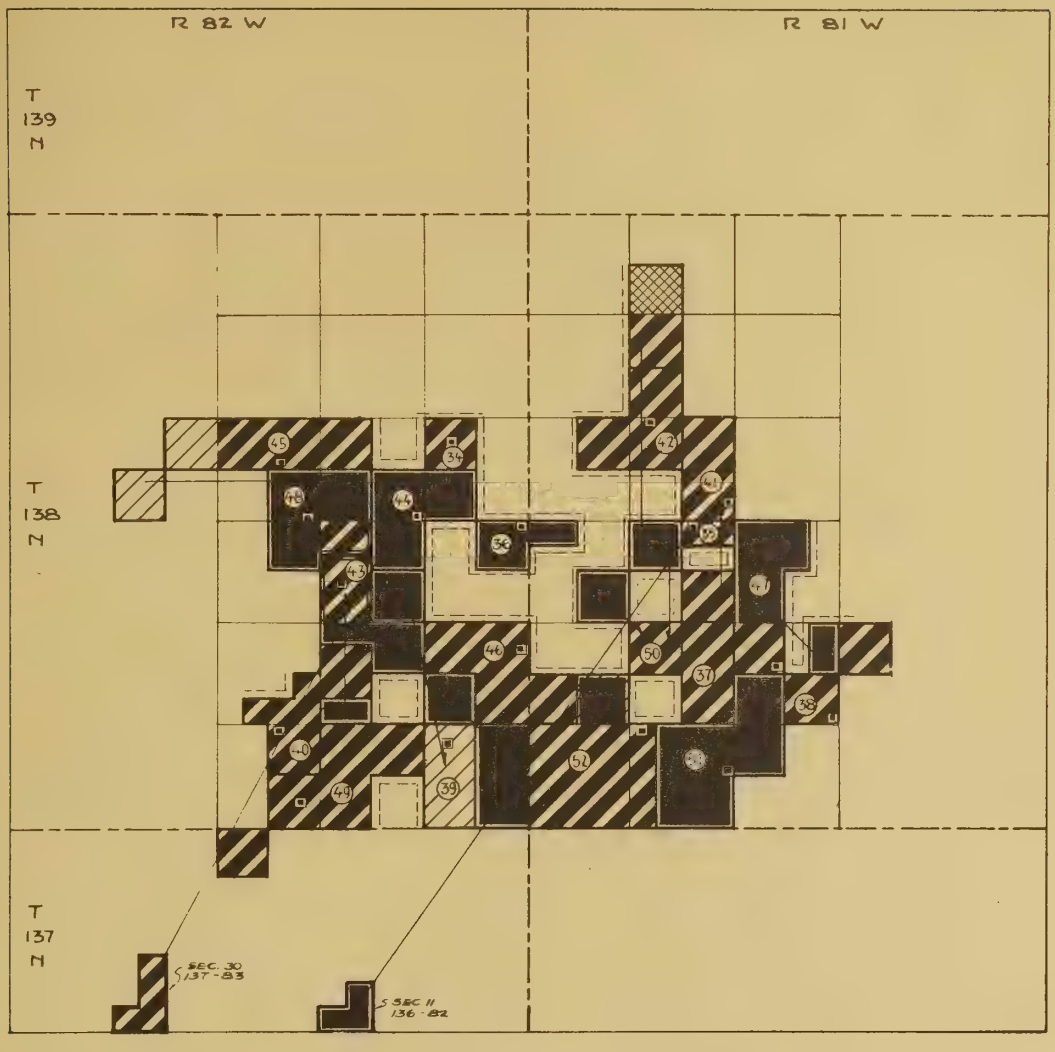

FIGURE-16

TYPE OF OWNERSHIP AND RELATIONSHIP TO OPERATING UNIT PATTERN

BASED ON STUDY OF 19 FARMS IN T.138N. R.81 AND 82W.

1936 MORTON COUNTY-NORTH DAKOTA 1936

SAMPLE AREA NO. 5

LEGEND

- OWNER OPERATED
- OTHER PRIVATELY OWNED
- CORPORATE OWNED
- PUBLICLY OWNED LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- 211 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 8

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LAND UTILIZATION DIVISION

LAND USE PLANNING SECTION

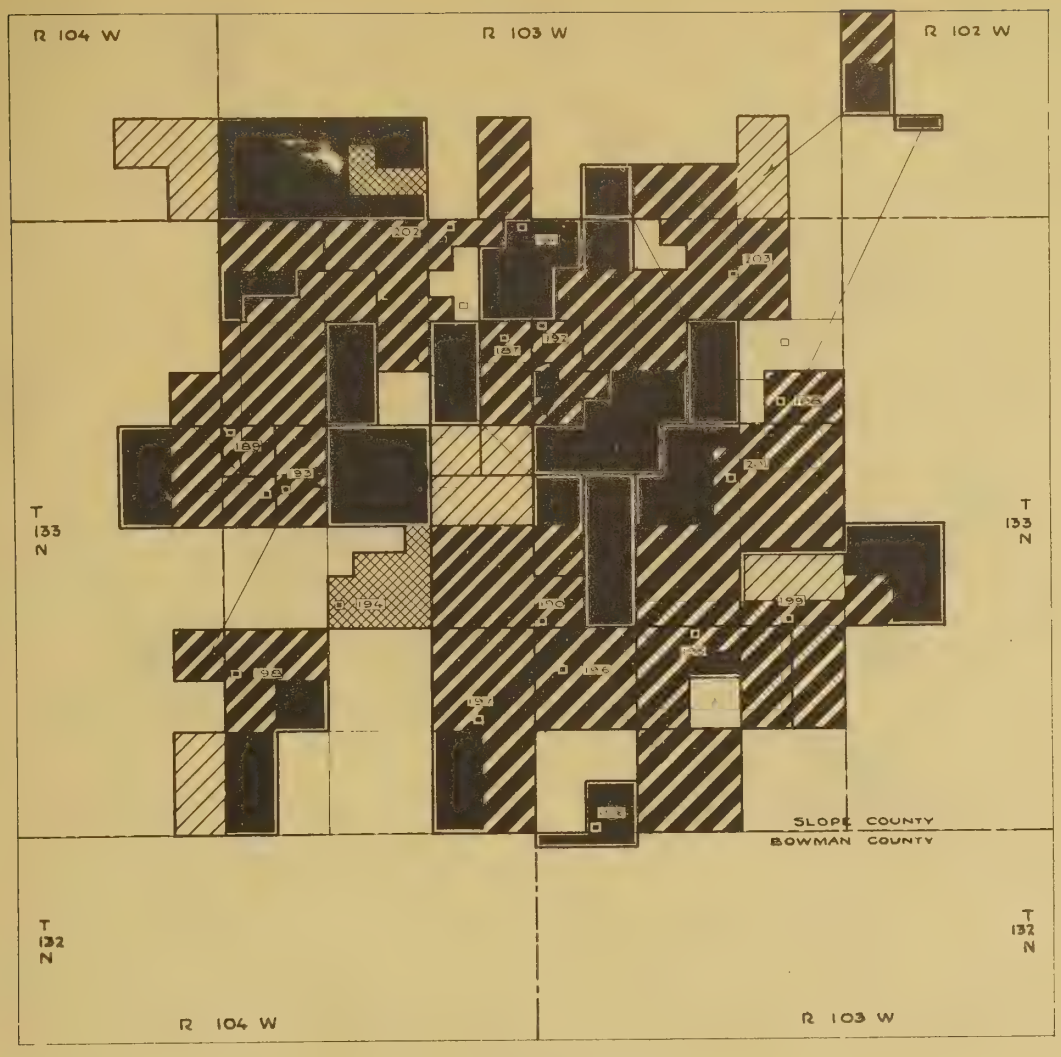

FIGURE-18

TYPE OF OWNERSHIP

AND

RELATIONSHIP TO OPERATING UNIT PATTERN

BASED ON STUDY OF 18 FARMS IN T.133N. R.103W.

1936 SLOPE COUNTY-NORTH DAKOTA 1936

SAMPLE AREA NO. 7

LEGEND

- OWNER OPERATED
- OTHER PRIVATELY OWNED
- CORPORATE OWNED
- PUBLICLY OWNED LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- [211] OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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RESETTLEMENT ADMINISTRATION-REGION 7

LAND UTILIZATION DIVISION

LAND USE PLANNING SECTION

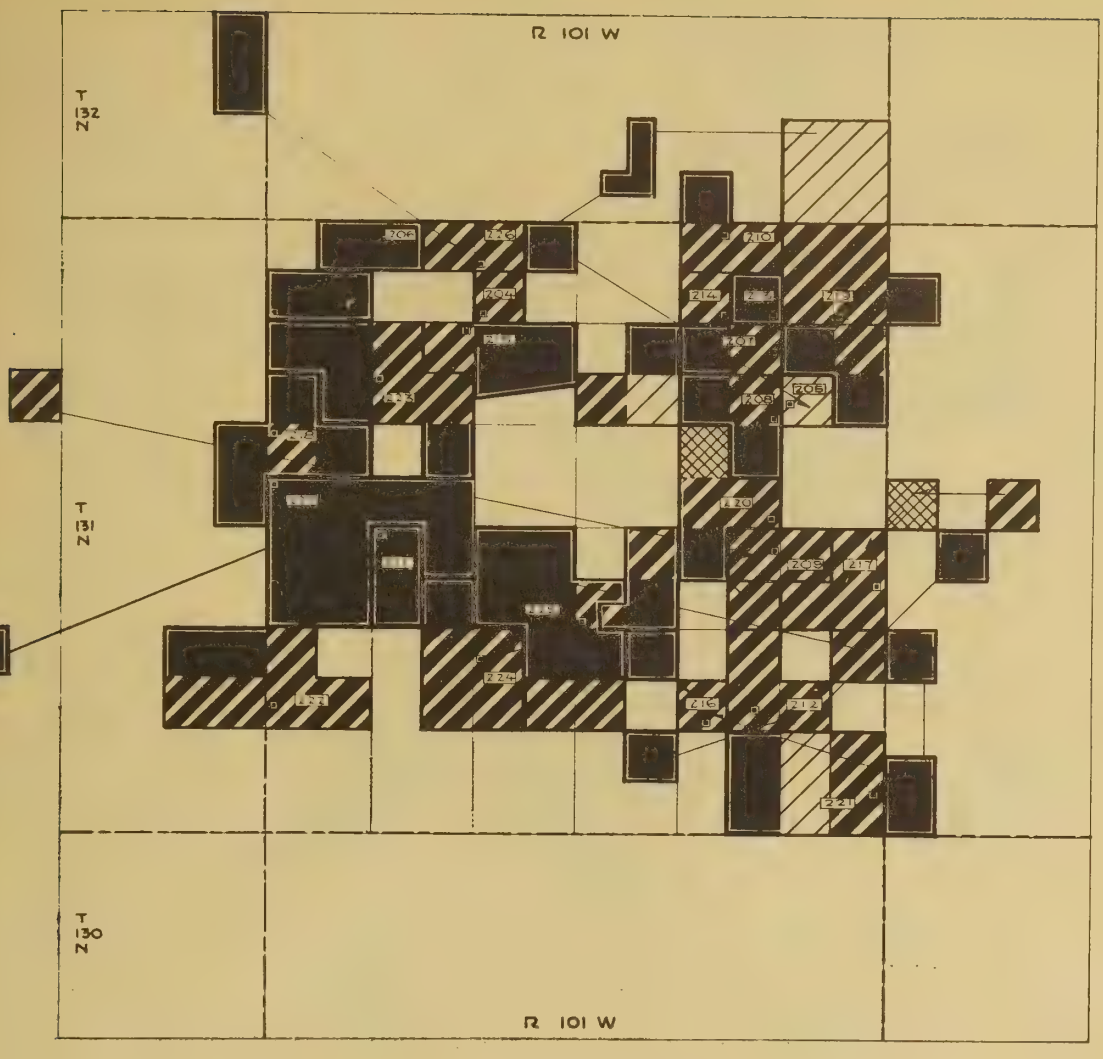

FIGURE-19
TYPE OF OWNERSHIP
AND
RELATIONSHIP TO OPERATING UNIT PATTERN

BASED ON STUDY OF 24 FARMS IN T.131N. R.101W.
1936 BOWMAN COUNTY - NORTH DAKOTA 1936
SAMPLE AREA NO. 8

LEGEND

- OWNER OPERATED
- OTHER PRIVATELY OWNED
- CORPORATE OWNED
- PUBLICLY OWNED LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- 211 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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LAND UTILIZATION DIVISION
LAND USE PLANNING SECTION

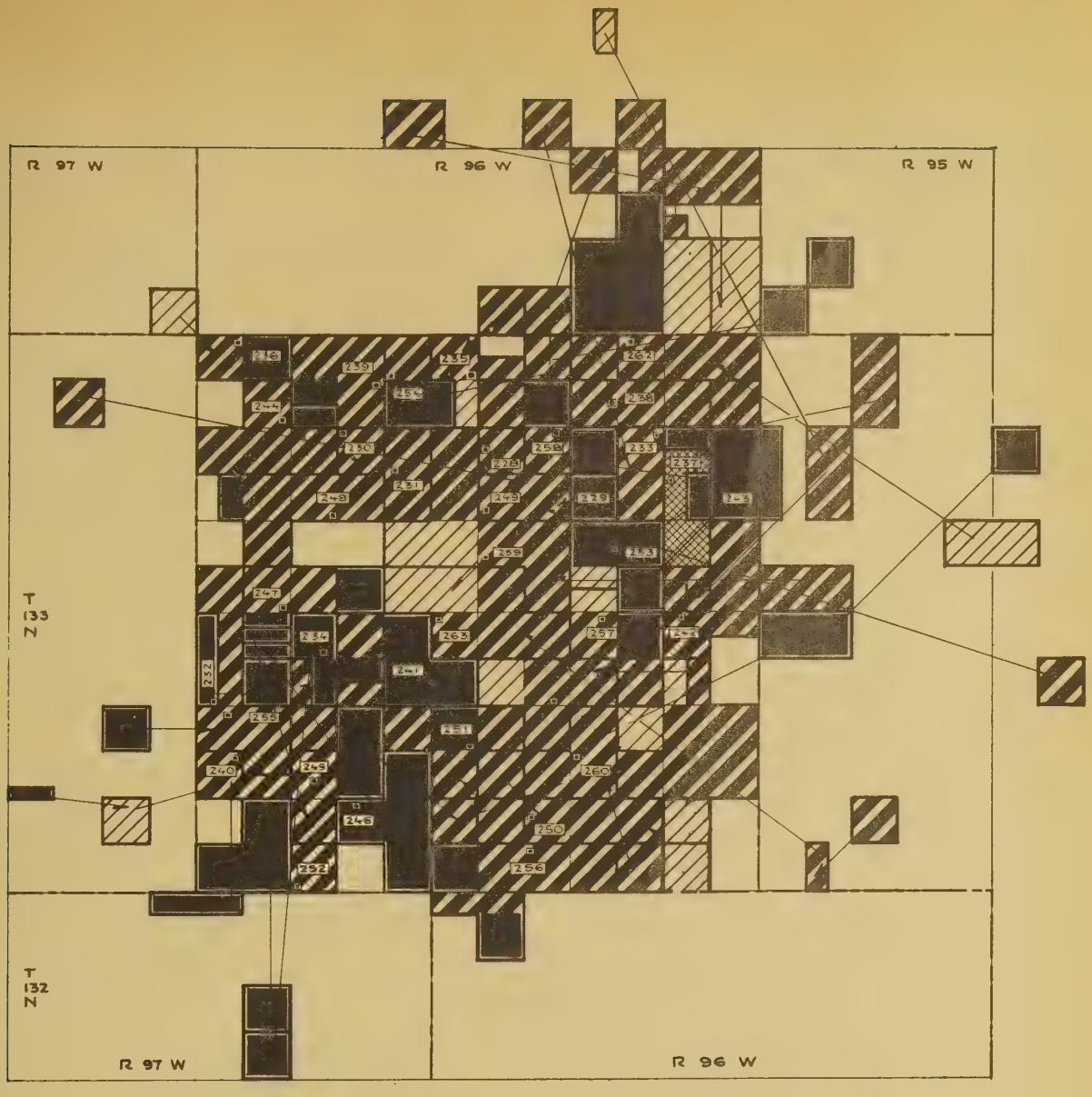

FIGURE-20
TYPE OF OWNERSHIP
AND
RELATIONSHIP TO OPERATING UNIT PATTERN

BASED ON STUDY OF 36 FARMS IN T. 133 N., R. 96 W.
1936 HETTINGER COUNTY, NORTH DAKOTA 1936
SAMPLE AREA NO. 9

LEGEND

- OWNER OPERATED
- OTHER PRIVATELY OWNED
- CORPORATE OWNED
- PUBLICLY OWNED LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- 211 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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LAND UTILIZATION DIVISION
LAND USE PLANNING SECTION

Table No. 16. Classification of farms according to the number of ownerships per operating unit in 9 sample areas in southwestern North Dakota, 1936

No. ownerships per operating unit	Sample Area No. 1		Sample Area No. 2		Sample Area No. 3		Sample Area No. 4		Sample Area No. 5		Five Morton County Areas		Sample Area No. 6		Sample Area No. 7		Sample Area No. 8		Sample Area No. 9		Four Areas Outside MortonCo.		Total Nine Sample Areas	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	10	30.3	8	21.6	5	17.9	22	50.0	9	47.4	54	33.5	7	30.4	3	16.7	2	8.3	8	22.2	20	19.8	74	28.2
2	11	33.3	14	37.9	16	57.1	13	29.5	5	26.3	59	36.6	6	26.1	4	22.2	8	33.3	16	44.5	34	33.7	93	35.5
3	6	18.2	11	29.7	6	21.4	7	15.9	2	10.5	32	20.0	3	13.0	2	11.1	7	29.2	9	25.0	21	20.8	53	20.3
4	3	9.1	4	10.8	0	0	1	2.3	3	15.8	11	7.5	3	13.0	6	33.3	5	20.8	3	8.3	17	16.8	28	10.7
5	0	0	0	0	0	0	1	2.3	0	0	1	0.6	1	4.4	2	11.1	1	4.2	0	0	4	3.9	5	1.9
6	2	6.1	0	0	1	3.6	1	0	0	0	3	1.2	1	4.4	0	0	0	0	0	0	1	1.0	4	1.5
7	1	3.0	0	0	0	0	0	0	0	0	1	0.6	1	4.4	0	0	1	4.2	0	0	2	2.0	3	1.1
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	1	4.3	1	5.6	0	0	0	0	2	2.0	2	0.8
Total Farms in area	33	100	37	100	28	100	44	100	19	100	161	100	23	100	18	100	24	100	36	100	101	100	262	100

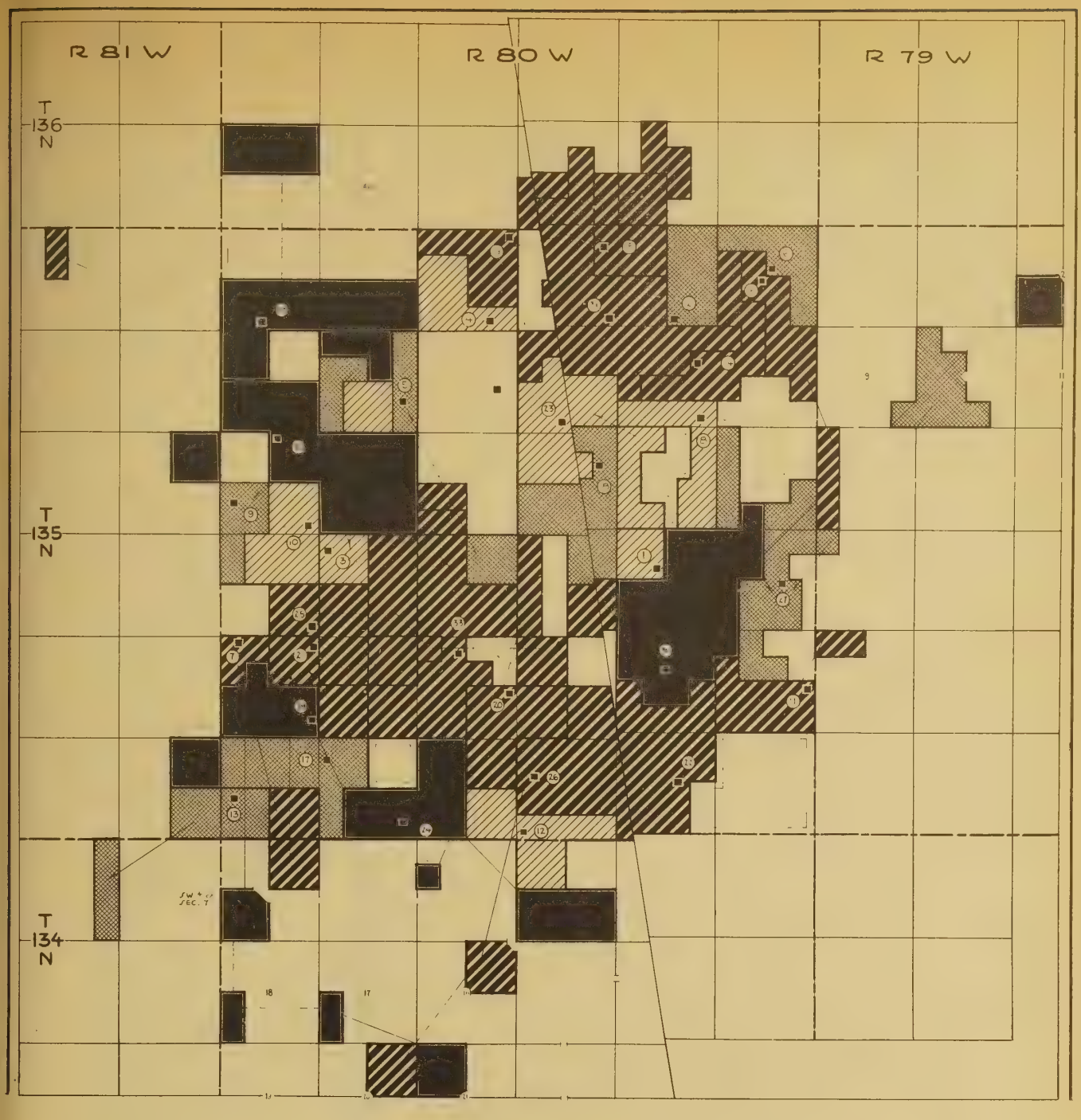

FIGURE - 21

NUMBER OF OWNERSHIPS PER OPERATING UNIT

BASED ON STUDY OF 33 FARMS IN T. 135 N. R. 80 W.
1936 MORTON COUNTY - NORTH DAKOTA 1936
SAMPLE AREA NO. 1

LEGEND

- 1-OWNERSHIP PER OPERATING UNIT
- 2-OWNERSHIPS " " "
- 3-OWNERSHIPS " " "
- 4-7 OWNERSHIPS PER OPERATING UNIT
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATORS HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- 21 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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LAND UTILIZATION DIVISION
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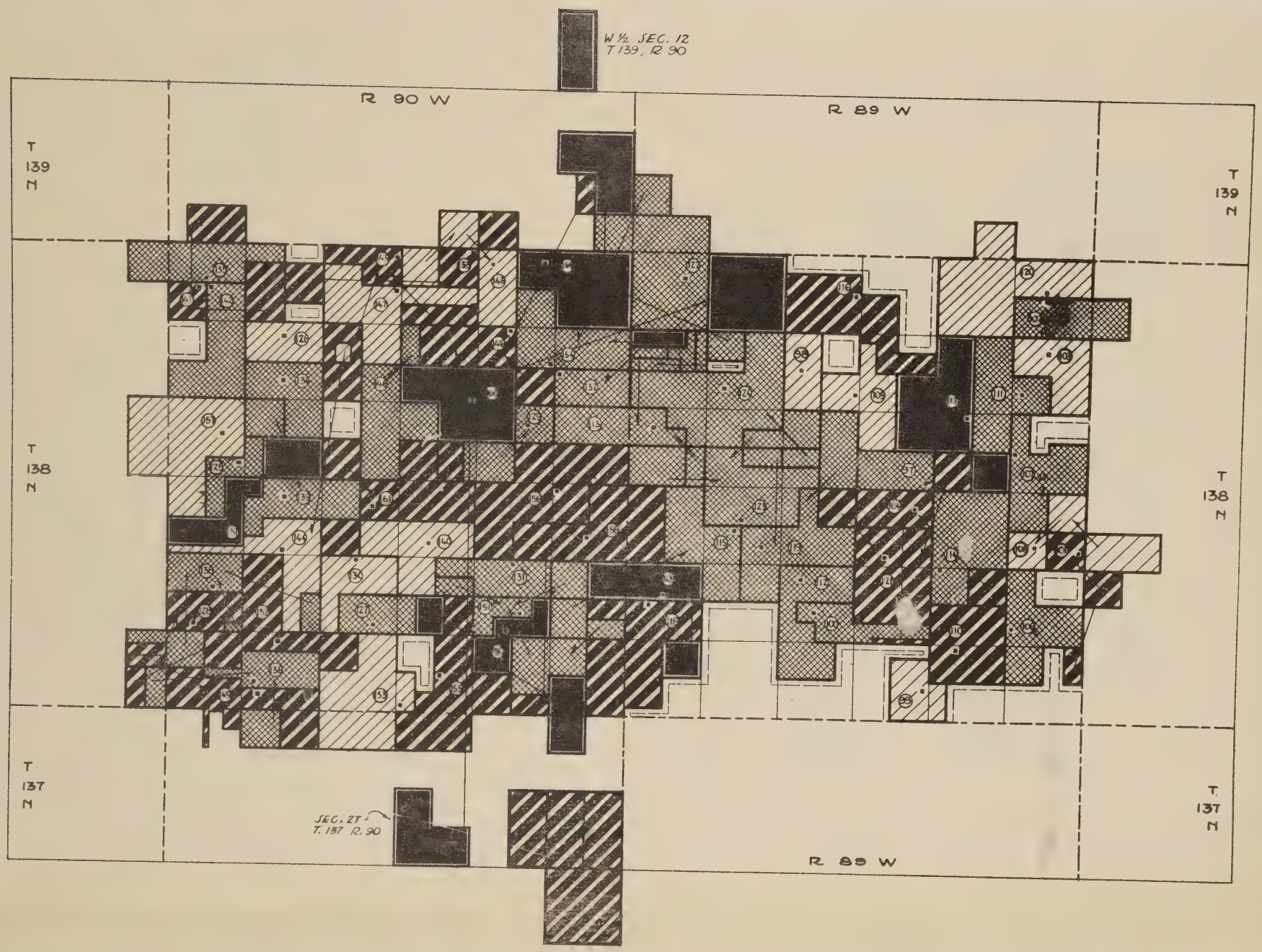

FIGURES-22 & 23
NUMBER OF OWNERSHIPS PER OPERATING UNIT

1936 — BASED ON STUDY OF 65 FARMS IN TWO TOWNSHIPS — T. 138 N. R. 89 AND 90 W. MORTON COUNTY, NORTH DAKOTA — 1936

SAMPLE AREAS - 2 AND 3

LEGEND

- 1-OWNERSHIP PER OPERATING UNIT
- 2-OWNERSHIPS " " "
- 3-OWNERSHIPS " " "
- 4-6-OWNERSHIPS PER OPERATING UNIT
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HDQTS.
- SECTION LINE
- TOWNSHIP LINE
- 211 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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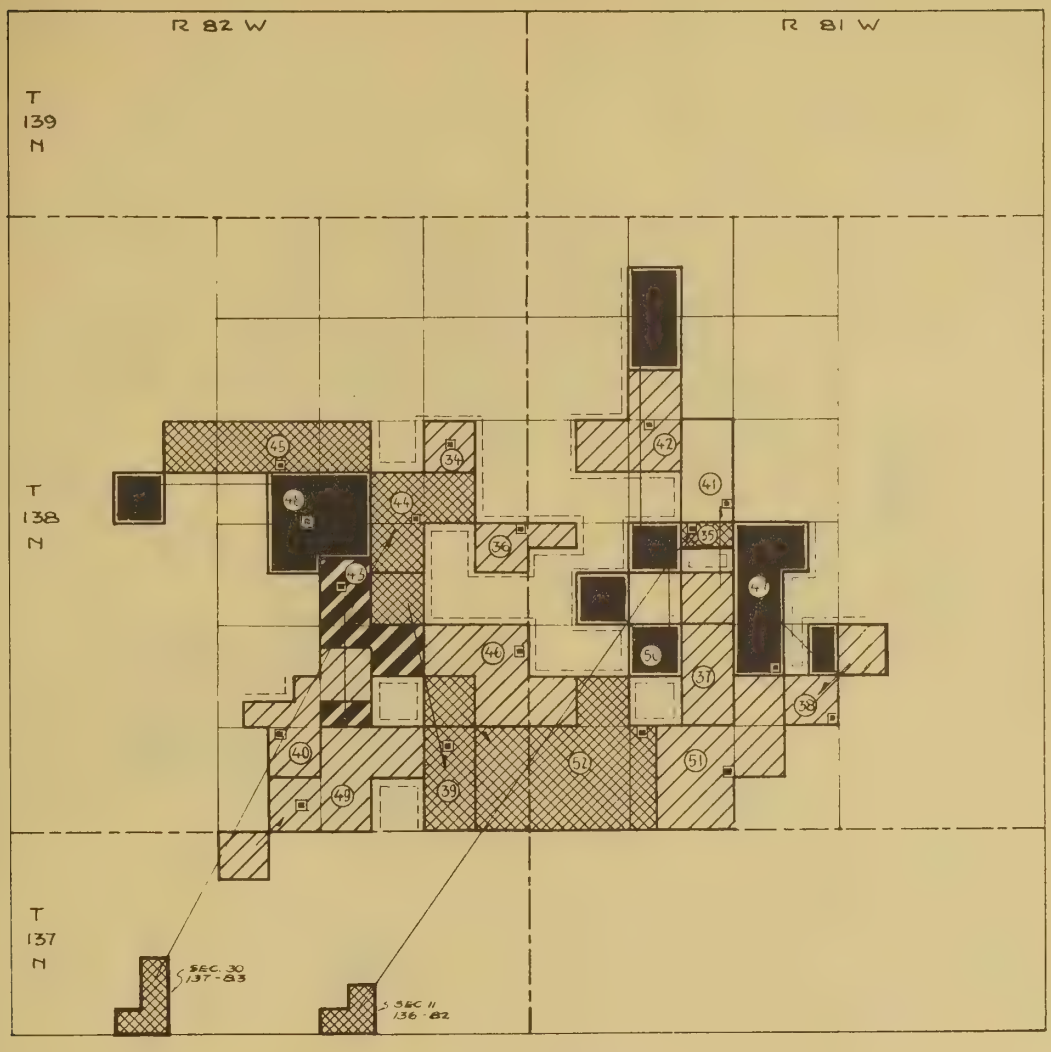

FIGURE-25
NUMBER OF OWNERSHIPS PER OPERATING UNIT

BASED ON STUDY OF 19 FARMS IN T.138 R.81 AND 82W.
1936 MORTON COUNTY-NORTH DAKOTA 1936
SAMPLE AREA NO. 5

LEGEND

- 1- OWNERSHIP PER OPERATING UNIT
- 2-OWNERSHIPS " " "
- 3-OWNERSHIPS " " "
- 4-6 OWNERSHIPS PER OPERATING UNIT
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- 211 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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LAND UTILIZATION DIVISION
LAND USE PLANNING SECTION

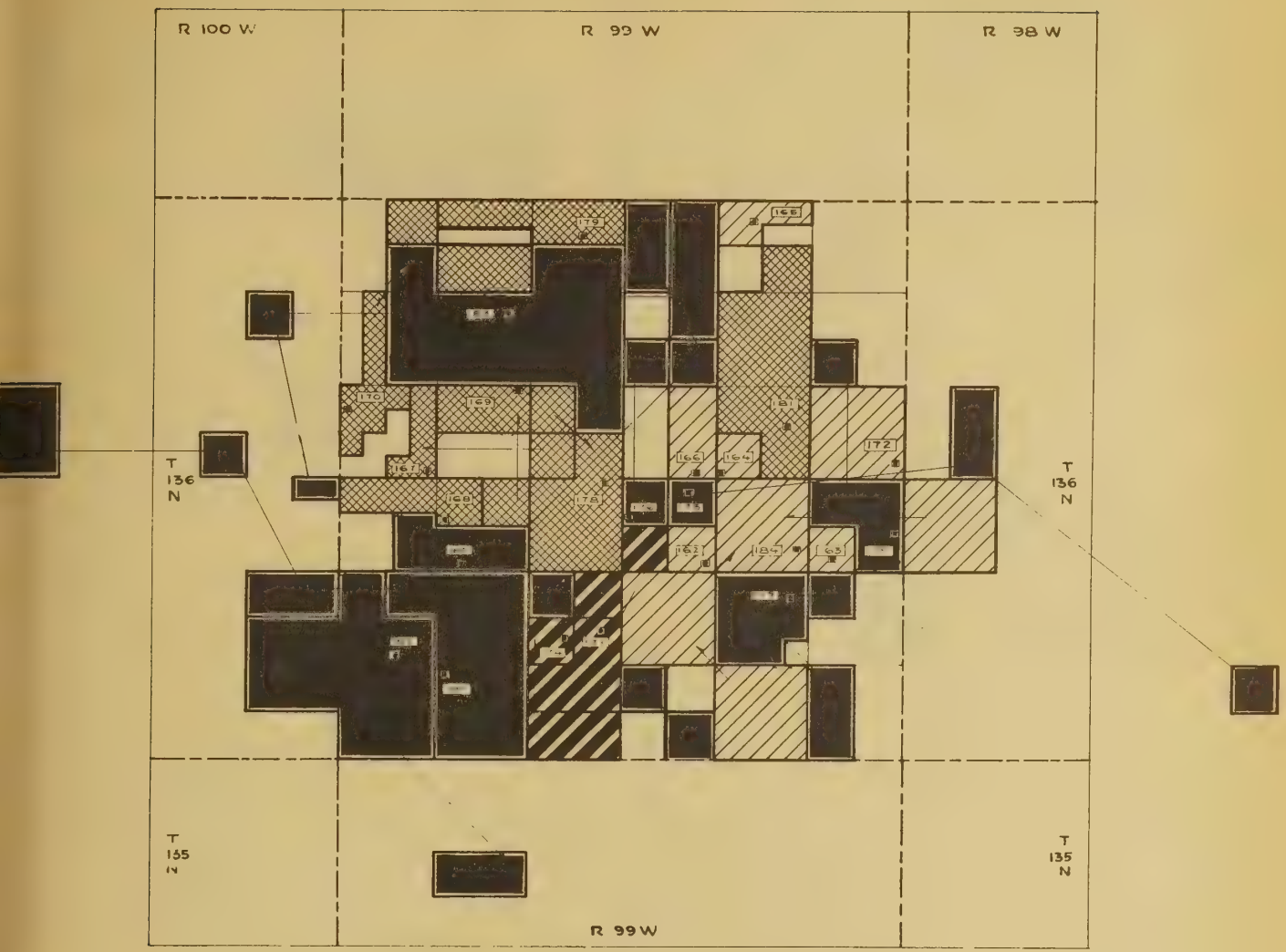

FIGURE-26
NUMBER OF OWNERSHIPS PER OPERATING UNIT

BASED ON STUDY OF 24 FARMS IN T.136N. R.99W.
1936 SLOPE COUNTY- NORTH DAKOTA 1936
SAMPLE AREA NO. 6

LEGEND

- 1-OWNERSHIP PER OPERATING UNIT
- 2-OWNERSHIPS " " "
- 3-OWNERSHIPS " " "
- 4-9 OWNERSHIPS PER OPERATING UNIT
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- [211] OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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LAND UTILIZATION DIVISION
LAND USE PLANNING SECTION

FIGURE-27
NUMBER OF OWNERSHIPS PER OPERATING UNIT

BASED ON STUDY OF 18 FARMS IN T.133N. R.103W.
1936 SLOPE COUNTY-NORTH DAKOTA 1936
SAMPLE AREA NO. 7

LEGEND

- 1-OWNERSHIP PER OPERATING UNIT
- 2-OWNERSHIPS " " "
- 3-OWNERSHIPS " " "
- 4-9 OWNERSHIPS PER OPERATING UNIT
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- 21 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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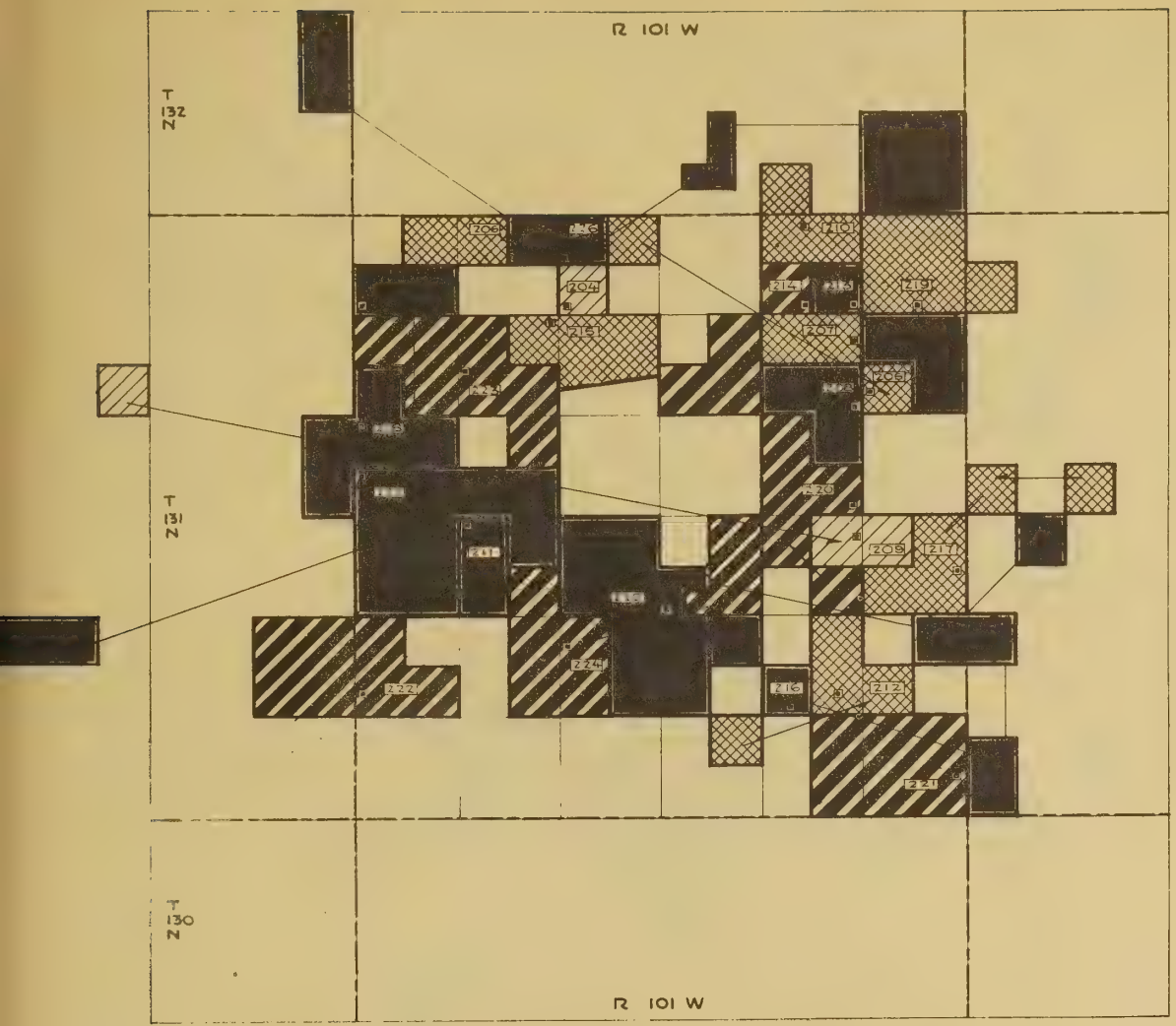

FIGURE-28
NUMBER OF OWNERSHIPS PER OPERATING UNIT

BASED ON STUDY OF 24 FARMS IN T.131 N. R.101 W.
1936 BOWMAN COUNTY - NORTH DAKOTA 1936
SAMPLE AREA NO. 8

LEGEND

- 1-OWNERSHIP PER OPERATING UNIT
- 2-OWNERSHIPS " " "
- 3-OWNERSHIPS " " "
- 4-7 OWNERSHIPS PER OPERATING UNIT
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- 211 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

PREPARED BY
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RESETTLEMENT ADMINISTRATION - REGION 7
LAND UTILIZATION DIVISION
LAND USE PLANNING SECTION

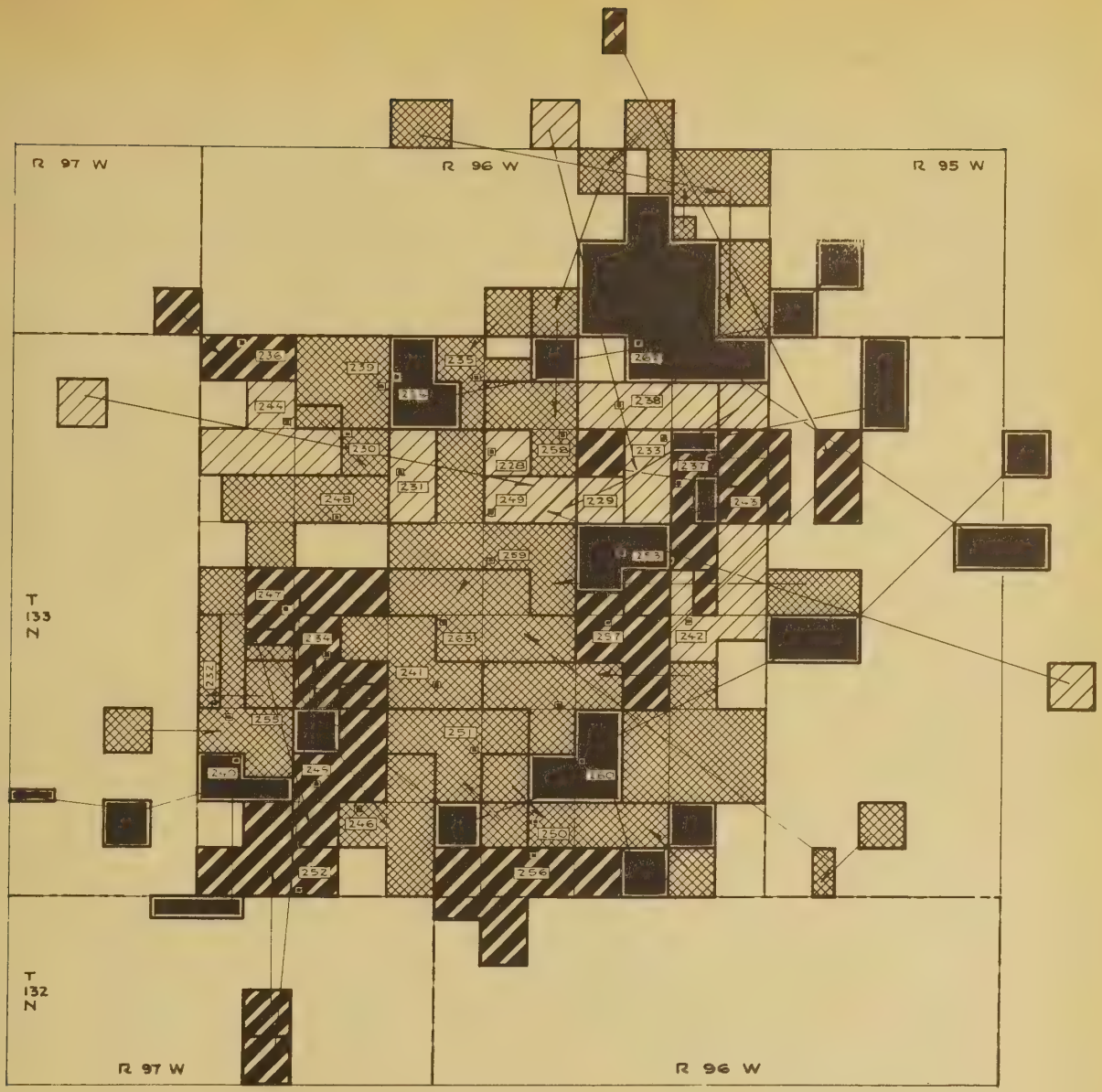

FIGURE-29
NUMBER OF OWNERSHIPS PER OPERATING UNIT

BASED ON STUDY OF 36 FARMS IN T.133N, R.96W
1936 HETTINGER COUNTY, NORTH DAKOTA 1936
SAMPLE AREA NO. 9

LEGEND

- 1-OWNERSHIP PER OPERATING UNIT
- 2-OWNERSHIPS " " "
- 3-OWNERSHIPS " " "
- 4-9 OWNERSHIPS PER OPERATING UNIT
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- [211] OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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LAND UTILIZATION DIVISION
LAND USE PLANNING SECTION

TAX DELINQUENCY

Tax delinquency is prevalent in various degrees in all the nine sample areas. On only 22.2% of the land in the 9 sample areas are the taxes paid up. This is shown in Table No. 17. Eight per cent of the land is tax exempt, and 13.8% is subject to tax deed, being delinquent for five years or more. Fifty-five and one-tenth per cent of the land is delinquent from 1 to 4 years.

As is shown in the table, there is considerable variation in the percentage of the land that is delinquent. Area No. 1, for instance, has 12.8% now tax exempt and 27.4% is subject to tax deed, which means that the state and county would own 40.2% of the land in this township if the present moratorium were lifted and the county took title to the land delinquent 5 years or over.

Table No. 18 shows the amount and percentages of the total tax levied for the 10 year period, 1926-1935, that was paid on time, paid after delinquent, and still unpaid as of December 1, 1936, in each of the 9 sample areas.

Table No. 17. Amount and percentage of land on which taxes are paid up or delinquent for various numbers of years, or tax exempt as of December 1, 1936 in 9 sample areas in southwestern North Dakota

Sample Area No.	Paid up		Acreage Delinquent										Tax Exempt		Total Ac for Towns
			1 year	Per cent	2 years	Per cent	3 years	Per cent	4 years	Per cent	5 years & over*	Per cent	Acres	%	Acres
	Acres	Percent													
5	7,108	30.9	5,100	22.1	3,994	17.3	1,678	7.2	760	3.3	1,435	6.2	2,918	12.6	22,993
3	2,217	9.6	3,464	15.0	2,947	12.8	6,510	28.2	1,520	6.6	3,749	16.2	2,599	11.2	23,006
2	3,231	14.0	5,690	24.7	4,094	17.8	4,955	21.5	960	4.1	2,757	12.0	1,283	5.5	22,970
4	5,184	22.6	7,155	31.2	2,459	10.7	4,511	19.6	640	2.7	1,681	7.3	1,280	5.5	22,910
1	4,644	20.1	2,721	11.8	3,591	15.5	1,394	6.0	1,400	6.0	6,314	27.4	2,964	12.8	23,028
9	5,554	24.1	5,873	25.5	6,008	26.1	1,600	6.9	160	0.7	1,840	8.0	1,920	8.3	22,955
6	4,568	19.7	2,578	11.1	4,715	20.4	3,098	13.4	1,276	5.5	4,578	19.8	2,291	9.9	23,104
7	5,286	22.9	4,310	18.7	2,587	11.2	3,112	13.5	2,806	12.1	3,012	13.0	1,920	8.3	23,033
8	7,920	34.3	3,961	17.1	3,354	14.5	1,117	4.8	1,920	8.3	3,880	16.8	888	3.8	23,040
All areas	45,712	22.0	40,852	19.7	33,749	16.3	27,975	13.5	11,442	5.5	29,246	14.1	18,063	8.7	207,039

*Subject to tax deed

Table No. 18. Amount and percentage of total tax levied for the 10-year period, 1926-1935, that was paid on time, paid after delinquent, and still unpaid as of December 1, 1936 in 9 sample areas in southwestern North Dakota

Sample Area No.	Total tax levied 1926-1935	Amount						Per cent	Acquired by County or Bank of ND-Tax unpaid
		Per cent	Paid on time	Per cent	Paid when delinquent	Per cent	Still unpaid		
5	$ 60,199.95	53.1	$ 32,002.69	34.5	$ 20,823.20	11.8	$ 7,121.54	.4	$ 252.52
3	46,082.01	50.9	23,501.05	24.6	11,377.20	23.4	10,825.92	.8	377.84
2	59,616.58	57.1	34,073.48	25.1	15,004.29	17.6	10,538.81		
4	58,375.40	51.7	30,222.11	33.1	19,361.92	15.0	8,791.37		
1	55,833.97	32.6	18,251.82	40.1	22,422.74	27.1	15,159.41		
9	58,026.79	50.3	29,193.25	36.2	21,051.37	13.4	7,782.17		
6	59,286.17	36.4	21,583.48	39.9	23,689.85	22.8	13,542.30	.7	470.54
7	41,153.75	54.1	22,296.99	28.6	11,782.01	17.1	7,074.75		
8	39,311.37	50.5	19,876.16	29.8	11,715.31	19.6	7,719.90		
All areas	$477,885.99	48.3	$231,001.03	32.9	$157,227.89	18.5	$88,556.17	.2	$1,100.90

Less than half (48.3%) of the taxes levied were paid on time during this period, 32.9% were paid after they became delinquent, and 18.5% still remained unpaid as of December 1, 1936. A small amount of the taxes were paid through tax deed or cancelled because the land became tax exempt through foreclosure by the Bank of North Dakota. Area No. 1 has the greatest amount of delinquency as well as the greatest acreage of tax delinquent land as shown in Table No. 17.

Table No. 19 shows the number of owner-operated and leased tracts in the nine sample areas grouped according to the degree of delinquency of the total taxes levied for the 10-year period, 1926-1935 as of December 31, 1936. Apparently there is little or no relationship between type of ownership and tax delinquency. While taxes were paid up on only 17.7% of the owner-operated tracts, they were paid up on 33.5% of the leased tracts in the 9 sample areas. It is interesting to note that none of the owner-operated tracts fall into the class on which 76-100% of the taxes are delinquent, while 4.5% of the leased tracts fall in this classification. This may be an indication that owner-operators have a better record of tax payment as a rule, although due to extremely unfavorable conditions during the last few years their reserves have been so depleted that they were unable to meet payments of taxes as well as land owners who may have had some other source of income from which they could pay taxes.

Table No. 19. Owner-operated and leased tracts in nine sample areas in southwestern North Dakota grouped according to degree of delinquency of the total taxes levied for the 10-year period 1926 to 1935.

Tax Status*	Owner-operated tracts		Leased tracts		No. record		Total tracts	
	No.	%	No.	%	No.	%	No.	%
Non-delinquent	92	17.7	134	33.5	50	23.4	276	24.3
1 to 25% delinquent	284	54.6	135	33.8	81	37.8	500	44.1
26 to 50% "	125	24.0	83	20.7	55	25.7	263	23.2
51 to 75% "	19	3.7	30	7.5	25	11.7	74	6.5
76 to 100% "	0	-	18	4.5	3	1.4	21	1.9
Total	520	100.0	400	100.0	214	100.0	1134	100.0

*As of December 31, 1936

Table No. 20 shows the tax status of the nine sample areas. The average tax per acre in 1934 was 20 cents compared to 25 cents for the ten-year period, 1926 to 1935. Delinquent taxes in the sample areas average 5 cents per acre or about 96 cents per $100 of assessed valuation. The average valuation per acre in 1934 was $5.03. The per acre valuation and assessment vary considerably between the several areas, as does the delinquency per acre and per $100 of assessed valuation. Tax delinquency is one indication of distress in the areas.

Table No. 20. Valuations, Tax Assessments, payments and delinquencies as of December 1, 1936 - in 9 sample areas in southwestern North Dakota

Sample Area No.	Total Assessed Acreage 1934	Total Assessed Valuation 1934	Average Valuation Per Acre 1934	1934 Total Tax Assessed	1934 Tax Per Acre (cents)	1926-1935 Average Annual Assessment	Tax Per Acre Av. 1926-35 (cents)	Total Delinquent Tax	Delinq. Tax per acre (cents)	Tax Delinquency per $100 assessed valuation
5	20,071	$115,216	$5.74	$4,425.76	.22	$6,019.99	.30	$ 737.41	.04	$ .64
3	20,727	101,592	4.89	3,615.54	.17	4,545.17	.22	1,124.94	.05	1.10
2	21,687	117,059	5.40	4,483.22	.27	5,961.66	.27	1,053.88	.05	.90
4	21,630	113,174	5.23	4,769.18	.22	5,837.54	.27	877.34	.04	.78
1	20,103	98,228	5.10	4,274.49	.22	5,583.40	.29	1,515.94	.08	1.54
9	21,035	129,358	6.14	4,866.58	.23	5,802.68	.27	778.22	.04	.60
6	21,133	106,651	5.05	4,864.54	.23	5,928.62	.23	1,401.28	.07	1.31
7	21,113	68,987	3.29	2,912.94	.14	4,118.56	.20	710.66	.03	1.03
8	22,400	105,78	4.71	3,540.86	.16	3,931.14	.18	771.99	.03	.73
Total 9 sample areas	189,899	956,047	5.03	37,752.11	.20	47,728.76	.25	8,971.66	.05	.96

An interesting study of the relationship of assessment value to soil productivity ratings was made in connection with this sample area study. The purpose of the study was to measure the relation of the present assessment values to productivity ratings prepared by the Bureau of Chemistry and Soils, and the North Dakota Experiment Station. These productivity ratings were made on the basis of soils and a weighted average was computed for each forty acre tract. For the purpose of this study, these forty-acre tracts were combined into weighted averages for each of the assessment tracts listed in the county records.

In order to obtain a measure of present over-or-under-assessment according to soil productivity ratings, it was necessary to put the assessed valuation and the productivity ratings on a comparable basis. This was done by assigning a value on the basis of the productivity ratings for each tract, which would total the same amount for all tracts as the present assessed valuation. This was done by computing the mean assessed valuation and assigning this valuation to the mean productivity rating. Each assessment tract was then given a value on the basis of its productivity rating, as determined from the value placed on the mean productivity rating. An assessment ratio for each assessment tract was then computed by dividing the present assessed valuation

from the valuation determined from the productivity rating. If this ratio exceeded 100, the tract was considered over-assessed, and if the ratio was less than 100, the tract was considered as under-assessed.

Figure No. 30 illustrates the tendency to over-assess the poorer quality land and to under-assess the better quality land. This figure is based upon a comparison of assessed valuation to the valuation based upon the soil productivity on 458 tracts of land in Sample Areas No. 1, 2 and 3. The tracts were grouped by productivity ratings, and each bar indicates the average ratio of the assessed value to the value based upon productivity ratings.

Figure No. 31 shows the "effective" tax rate on the tracts of land in the various productivity rating groups. There is a very definite indication that the poorer quality land is now burdened with more than its just share of the tax burden. This is important from the standpoint of land use planning. In many cases, the taxes now levied on this poorer quality land are so high that it is not economically feasible to use it for the purpose to which it is best suited, i.e., grazing. Where this situation exists, changes in the present system of taxation must be made before suitable land use can be developed or maintained.

FIG. 30 — THE AVERAGE ASSESSMENT RATIO for LAND of VARIOUS PRODUCTIVITY RATINGS

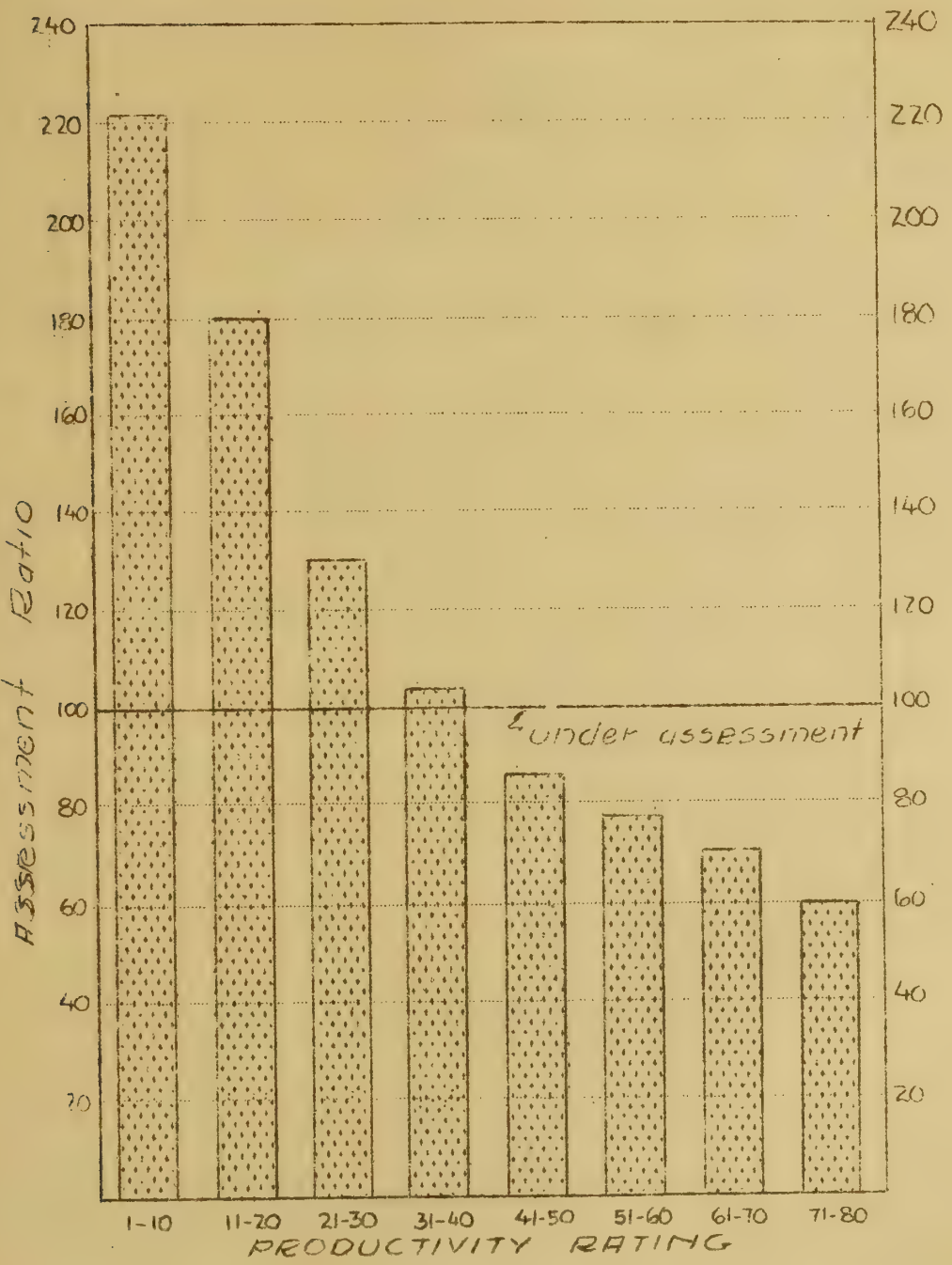

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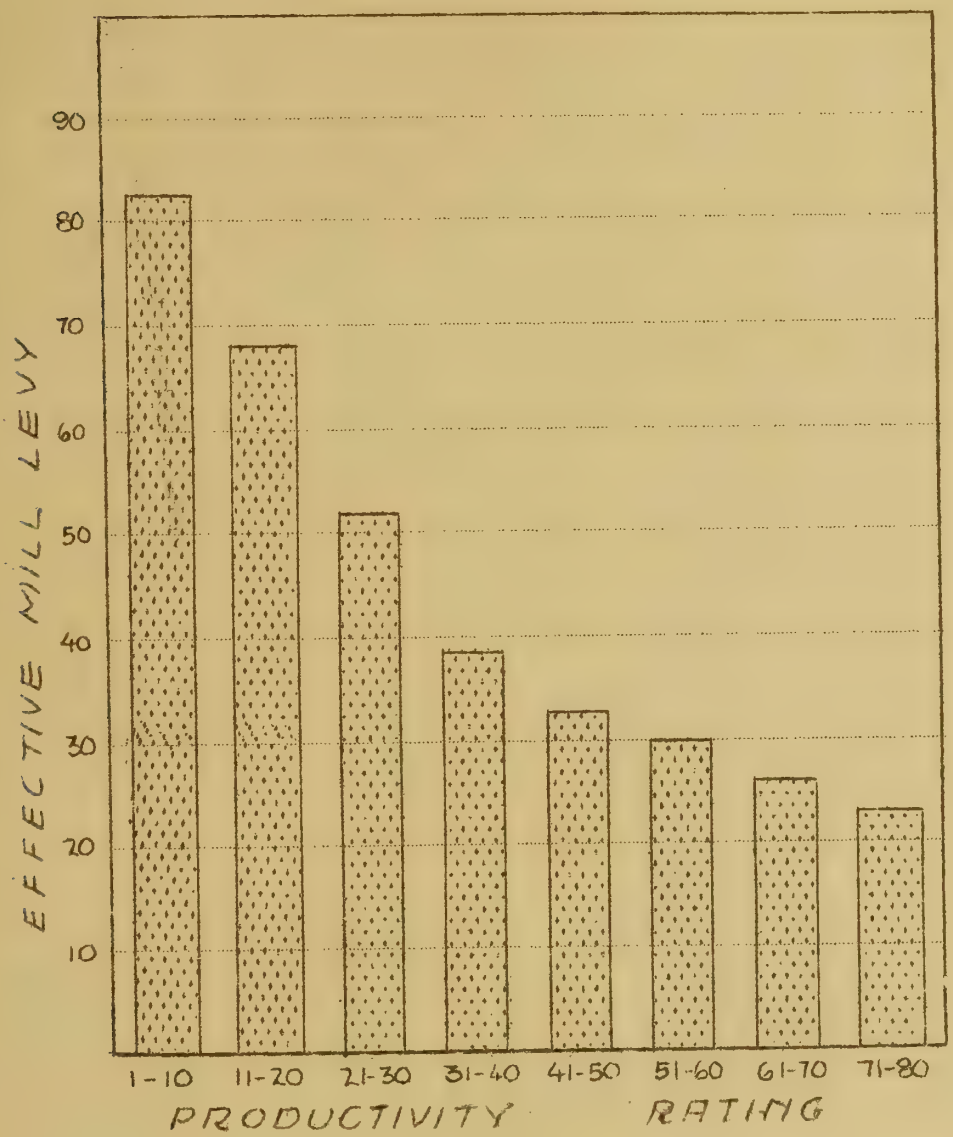
FIG. 31 — THE EFFECTIVE TAX RATE ON LAND of VARIOUS PRODUCTIVITY RATINGS



COMPUTED BY DIVIDING THE 1934 TAXES LEVIED ON LAND IN EACH GROUP BY THE PRODUCTIVITY VALUE

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CLASSIFICATION OF LAND

As previously stated in the outline of the procedure used in this study, the classification of the soils as to use-suitability was limited to the five sample areas located in Morton County where detailed soils maps (scale 2 inches to the mile) were available. The inherent physical and chemical characteristics of the soil as expressed in the profile, together with relief, degree of salinization and stoniness were the basic factors considered in determining the natural use-suitabilities of the land. Factors such as distance to market, balance between crop and grazing land, and other economic and social criteria were not considered. However, due to the topography and the intricate soils pattern, the size and the location of areas in relationship to ownership lines and uncrossable drains were necessarily given consideration in this classification. In general, any area of less than 10 acres was not classified as crop land, however favorable the soil and physical characteristics may have been, and where a small part of a relatively large area of good crop land extended across an ownership line or an uncrossable drain, this part of such area usually was not classified as crop land

The North Dakota State College soils survey of Morton County is to be used for tax assessment and for this purpose the soils have

been given a percentage rating, based on estimated relative productivity. Upon examination, it was found that any soil series having a productivity rating below 50 per cent should not be cultivated. However, topography must be considered as well as the productivity of the soil. It is generally conceded that any land having a "C" slope (7½-15%) should not be cultivated except in a very few cases where the soil is deeper than average, such as the Morton loam and silt loams. Following is a brief description of those soils series now frequently cultivated, but suitable only for grazing.

Hebron Series

These soils are found mostly on steeper upland slopes. They are developed from residual material, which is derived from the Fort Union or the Lance formations, together with drift. The top soil of this series is very shallow. When these soils are cultivated on slopes of 7½ to 15%, they are extremely subject to wind erosion and the high proportion of water runoff makes them droughty and subject to minor water erosion. "Scabbiness" or accumulation of salts is very prevalent and the soils should never be put under cultivation when this condition exists, because the accumulation of salts inhibits vegetative growth and affects soil structure in such a manner that cultivation is exceedingly difficult. Hebron loam or silt loam is the only type that can successfully be used as crop land and then only when the slope does not exceed 7½ per cent.

Almont Series

The Almont series vary considerably in their value. The soils are developed from deposits of local alluvium from the higher buttes and hills and have not remained in place long enough to form a mature profile. The surface soil is brownish grey and at about 12 inches this changes to an olive, drab clay with an ill-defined, coarse prismatic structure. If the loam and silt loams are found in an "unsolonized" state they can be cultivated; however, most of the Almont series are "solonized" and in that condition should not be used for cropping.

Morton Series

The loams and silt loams of the Morton series may be used as crop land as long as they are relatively free from accumulation of salts and the slope does not exceed 15%. The heavier types are more often found to be "scabby" and should not be cultivated. The sandy loams are inclined to be droughty and are liable to blow.

The sands and fine sands of all series should not be used as arable land because they are too subject to wind erosion and are too droughty to be dependable for crop production in years of scant rainfall.

The classification of the land and its relationship to the present use is shown for each of the five Norton County sample areas on the five maps, Figures No. 32, 33, 34, 35 and 36. The relationship of the use-suitability and present use of the land in these areas is also shown in Table No. 21. The percentage of the total area which is under cultivation varies from 32.8% in Area No. 1 to 54.7% in Area No. 5, the average for the five areas being 43.2%. According to this classification, 36.6% of the land under cultivation is unsuited for crop production. In Area No. 2, 40% of the land now cultivated is not suited for crop production. There is, therefore, considerable difference between the five sample areas in the adjustments needed in order to arrive at the proper land use, but, on the average, 15.8% of the total area, or 36.6% of the land now cultivated should be regrassed. It might be stated here that the relatively large amount of misuse of the land in Area No. 2 is probably due to the fact that topography of this area is such that it is possible to cultivate a great deal of land where the soil is just shallow enough or the slope just steep enough to classify it as unfit for continued cultivation according to the standards used.

LAND NOW CULTIVATED

WHICH IS NOT SUITED TO CROP PRODUCTION

WHICH IS SUITED TO CROP PRODUCTION

NATIVE GRASSLAND

WHICH IS SUITED TO CROP PRODUCTION

WHICH IS SUITED TO GRAZING USE

— SECTION LINE

USE-SUITABILITY OF LAND IN RELATION TO PRESENT USE

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SCALE of MILES 0 1

DATA FROM PLANETABLE SURVEYS
OF PHYSICAL AND CULTURAL FEATURES
MORTON CO. N. DAK

SOIL SURVEY BY BUREAU of CHEMISTRY *and* SOILS
and N. DAK. EXPERIMENT STATION-COOPERATING
PRESENT LAND USE SURVEY BY
LAND USE PLANNING SECTION
DRAWING BY
WORKS PROGRESS ADMINISTRATION
O P NO. 65-73-2363

LAND NOW CULTIVATED

WHICH IS NOT SUITED TO CROP PRODUCTION

WHICH IS SUITED TO CROP PRODUCTION

NATIVE GRASSLAND

WHICH IS SUITED TO CROP PRODUCTION

WHICH IS SUITED TO GRAZING USE

— SECTION LINE

USE-SUITABILITY OF LAND IN RELATION TO PRESENT USE

LAND USE PLANNING SEC.
LAND UTILIZATION DIVISION
RESETTLEMENT ADMINISTRATION
U.S. DEPARTMENT OF AGRICULTURE
REGION VII 1936

0 SCALE of MILES 1

DATA FROM PLANETABLE SURVEYS
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SOIL SURVEY BY BUREAU of CHEMISTRY *and* SOILS
and N. DAK. EXPERIMENT STATION-COOPERATING
PRESENT LAND USE SURVEY BY
LAND USE PLANNING SECTION
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R 90 W

T 138 N

LAND NOW CULTIVATED

- WHICH IS NOT SUITED TO CROP PRODUCTION
- WHICH IS SUITED TO CROP PRODUCTION

NATIVE GRASSLAND

- WHICH IS SUITED TO CROP PRODUCTION
- WHICH IS SUITED TO GRAZING USE

— SECTION LINE

USE-SUITABILITY OF LAND IN RELATION TO PRESENT USE

LAND USE PLANNING SEC.
LAND UTILIZATION DIVISION
RESETTLEMENT ADMINISTRATION
U.S. DEPARTMENT OF AGRICULTURE
REGION VII 1936

SCALE IN MILES 0 1

DATA FROM PLANETABLE SURVEYS
OF PHYSICAL AND CULTURAL FEATURES
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SOIL SURVEY BY BUREAU of CHEMISTRY *and* SOILS
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PRESENT LAND USE SURVEY BY
LAND USE PLANNING SECTION
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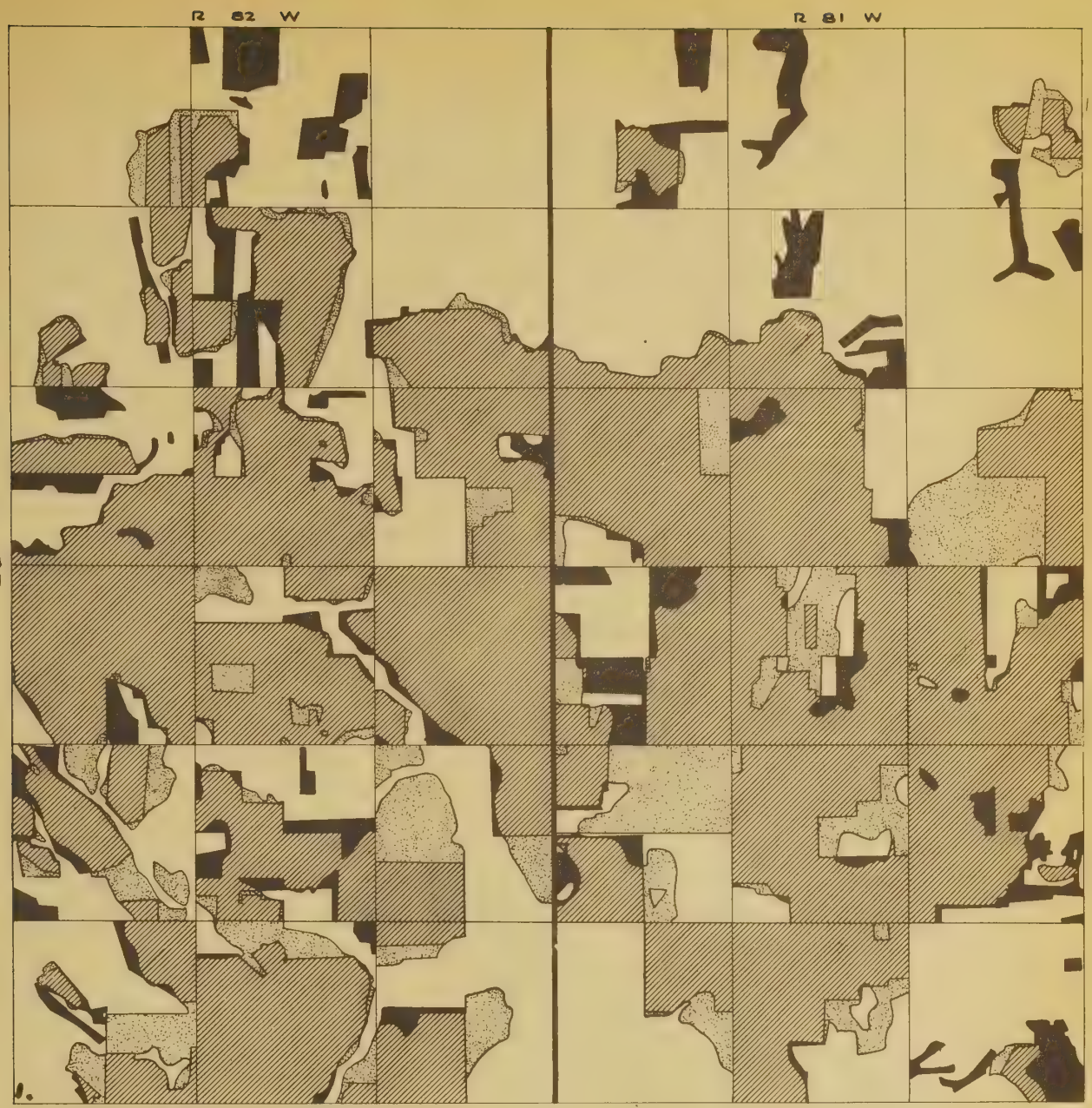

LAND NOW CULTIVATED

WHICH IS NOT SUITED TO CROP PRODUCTION

WHICH IS SUITED TO CROP PRODUCTION

NATIVE GRASSLAND

WHICH IS SUITED TO CROP PRODUCTION

WHICH IS SUITED TO GRAZING USE

— SECTION LINE

USE-SUITABILITY OF LAND IN RELATION TO PRESENT USE

LAND USE PLANNING SEC.
LAND UTILIZATION DIVISION
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REGION VII 1936

SCALE OF MILES

DATA FROM PLANETABLE SURVEYS OF PHYSICAL AND CULTURAL FEATURES
MORTON CO. N. DAK

SOIL SURVEY BY BUREAU of CHEMISTRY *and* SOILS *and* N. DAK. EXPERIMENT STATION-COOPERATING
PRESENT LAND USE SURVEY BY
LAND USE PLANNING SECTION
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Table No. 21. Use suitability of land in relation to present use based on study of 150 farms in 5 sample areas in Morton County, North Dakota, 1936

Sample Area No.	Total Area Operated (acres)	Land now cultivated								Native grass land					
		Total		Not suited to crop production			Suited to crop production			Total		Suited to crop prod.		Suited only to grazing use	
		Acres	Per cent total area	Acres	Percent of total area	% of land now cult.	Acres	Percent of total area	% of land now cult.	Acres	Percent of total area	Acres	Per cent total area	Acres	Per cent total area
2	17,906	9,587	53.5	4,698	26.2	49.0	4,889	27.3	51.0	8,319	46.5	830	4.6	7,489	41.8
3	19,472	8,995	46.2	3,830	19.6	42.5	5,165	26.5	57.4	10,477	53.8	548	2.8	9,929	51.0
4	22,260	7,838	35.2	2,610	11.7	33.3	5,228	23.5	66.7	14,422	64.8	1,185	5.3	13,237	59.5
5	10,840	6,006	55.4	411	3.8	6.8	5,595	51.6	93.2	4,834	44.6	697	6.4	4,137	38.2
1	22,702	7,888	34.7	2,980	13.1	37.8	4,908	21.6	62.2	14,814	65.3	564	2.5	14,250	68.8
All Areas	93,180	40,314	43.3	14,529	15.6	36.0	25,785	27.7	63.9	52,866	56.7	3,824	4.1	49,042	52.6

In all the five Norton County areas there is a small amount of native grass land which might be cultivated according to the use-suitability classification. This averages only 4.1 of the total area of the five townships, and the land under cultivation which is suitable for crop production averages 27.7 of the total area. Adding these together, it is found that only 31.8% of the total land in the five areas is suitable for crop production, while at the present time there is 43.3% of the total area under cultivation. This indicates that a net reduction in the cultivated land amounting to 11.5% of the total area is needed to bring about correct use of the land resources of the five sample areas.

In order to determine the relationship of the size of farm and the degree of misuse of the land, Table No. 22 was prepared. This table shows a tendency toward a greater misuse of land on the smaller units. This is indicated by the percentage of the land now cultivated which is suited to crop production. In the 160 to 240 acre size group only 52.8% of the land now cultivated is suited to crop production, while in the largest group 71.7% of the land now cultivated is classified as suited to crop production. The land now cultivated which is not suited to crop production amounts to 32.2% of the total acreage of the smallest size group, and only 10.3% of the total acreage of the largest size group.

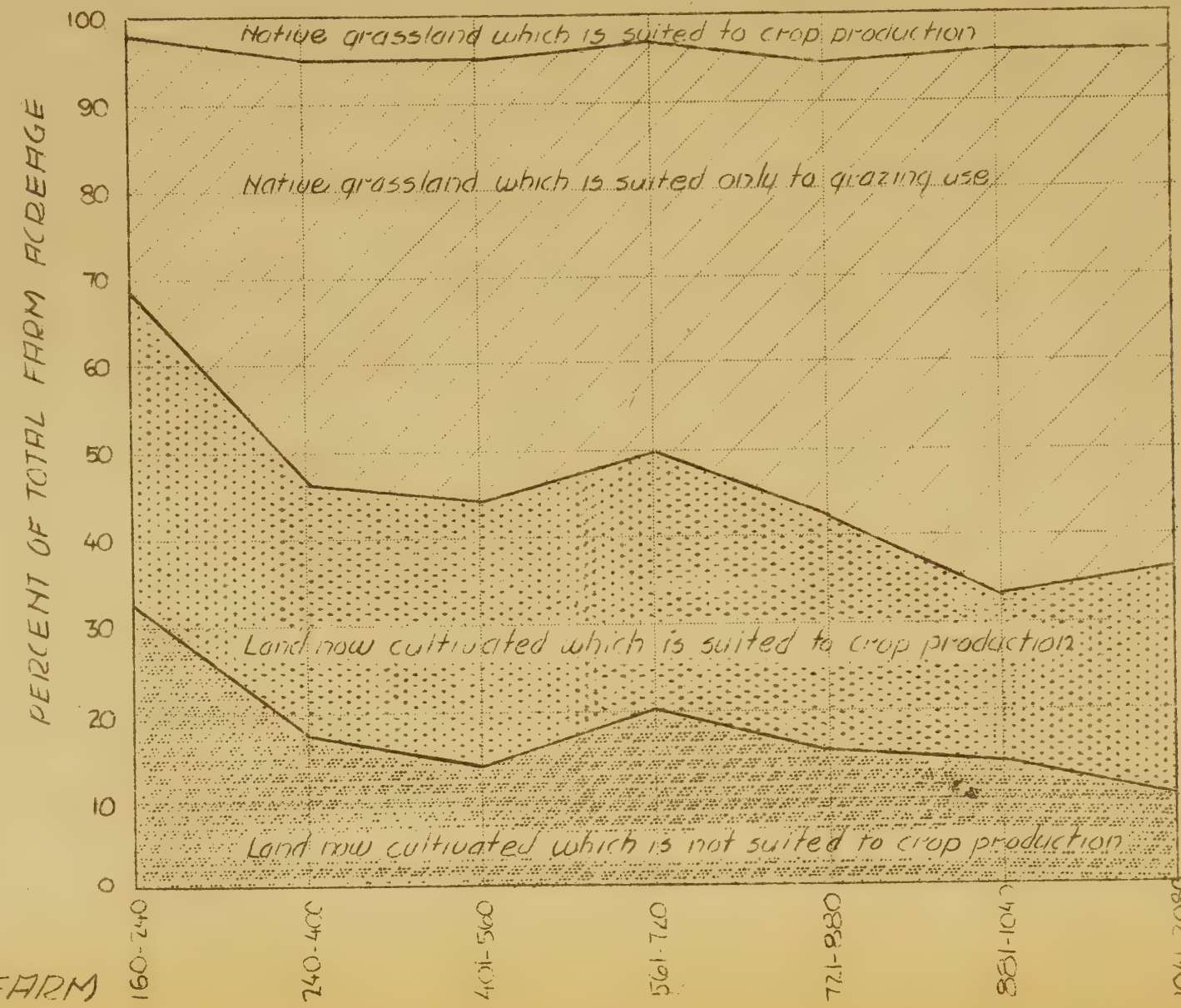
Table No. 22. Use suitability of land in relation to present use by size groups, based on a study of 150 farms - Morton County, North Dakota

Size Group	No. of farms in group	Total acres operated	Land now cultivated						Native grass land					Total acres suited to crop production
			Total (acres)	Suited to crop prod.			Not suited for production		Total (acres)	Suited to crop		Suited to grazing		
				Acres	% of total	% now cult.	Acres	% of total		Acres	% of total	Acres	% of total	
160- 240	6	1,240	842	443	35.7	52.6	399	32.2	398	26	2.1	372	30.0	469
241- 400	32	10,958	5,125	3,170	29.0	62.0	1,955	17.8	5,833	513	4.7	5,320	48.5	3,683
401- 560	35	17,327	7,583	5,224	30.1	68.9	2,359	13.6	9,744	787	4.5	8,957	51.7	6,011
561- 720	35	22,706	11,088	6,522	28.7	58.8	4,566	20.1	11,618	728	3.2	10,890	48.0	7,250
721- 880	23	18,425	7,643	4,895	26.6	64.0	2,748	14.9	10,782	879	4.8	9,903	53.7	5,774
881-1040	5	4,887	1,624	935	19.1	57.6	689	14.1	3,263	184	3.8	3,079	63.0	1,119
1041-2080	14	17,637	6,409	4,596	26.1	71.7	1,813	10.3	11,228	707	4.0	10,521	60.0	5,303
TOTAL	150	93,180	40,314	25,785	27.7	68.9	14,529	15.6	52,866	3,824	4.1	49,042	52.6	29,609

This relationship of land use and size of farm is also illustrated by Figure No. 37, which shows the percentage of the total farm acreage which is cultivated and in grass land, by size groups, and the amount of this total farm acreage that is suited to crop production. It appears that the operators of the smaller units have been driven to cultivate more land that is unfit for cultivation in their attempt to make a living for themselves and their families from these small acreages. In other words, the establishment of the smaller units in these areas has apparently been one of the contributing causes of the present misuse of the agricultural resources.

Having classified the land as to its use-suitability, the next step was to determine what effect the retirement of the unsuitable crop land from production would have upon the present operating units. First the operating units were classified as to type and the sufficiency of their present acreage to support the average farm family. The classification of each operating unit was based upon the extent of and the relationship between the classified crop and grazing land as related to the size and organization of the unit. For the particular type of organization involved, the following acreages were considered as the minimum which would enable the average family to maintain an adequate standard of living.

FIG. 37 — RELATIONSHIP OF PRESENT LAND USE TO SIZE OF FARM-1936
BY SIZE GROUPS BASE ON STUDY OF 150 FARMS IN FIVE SAMPLE AREAS, MORTON CO. N. DAKOTA



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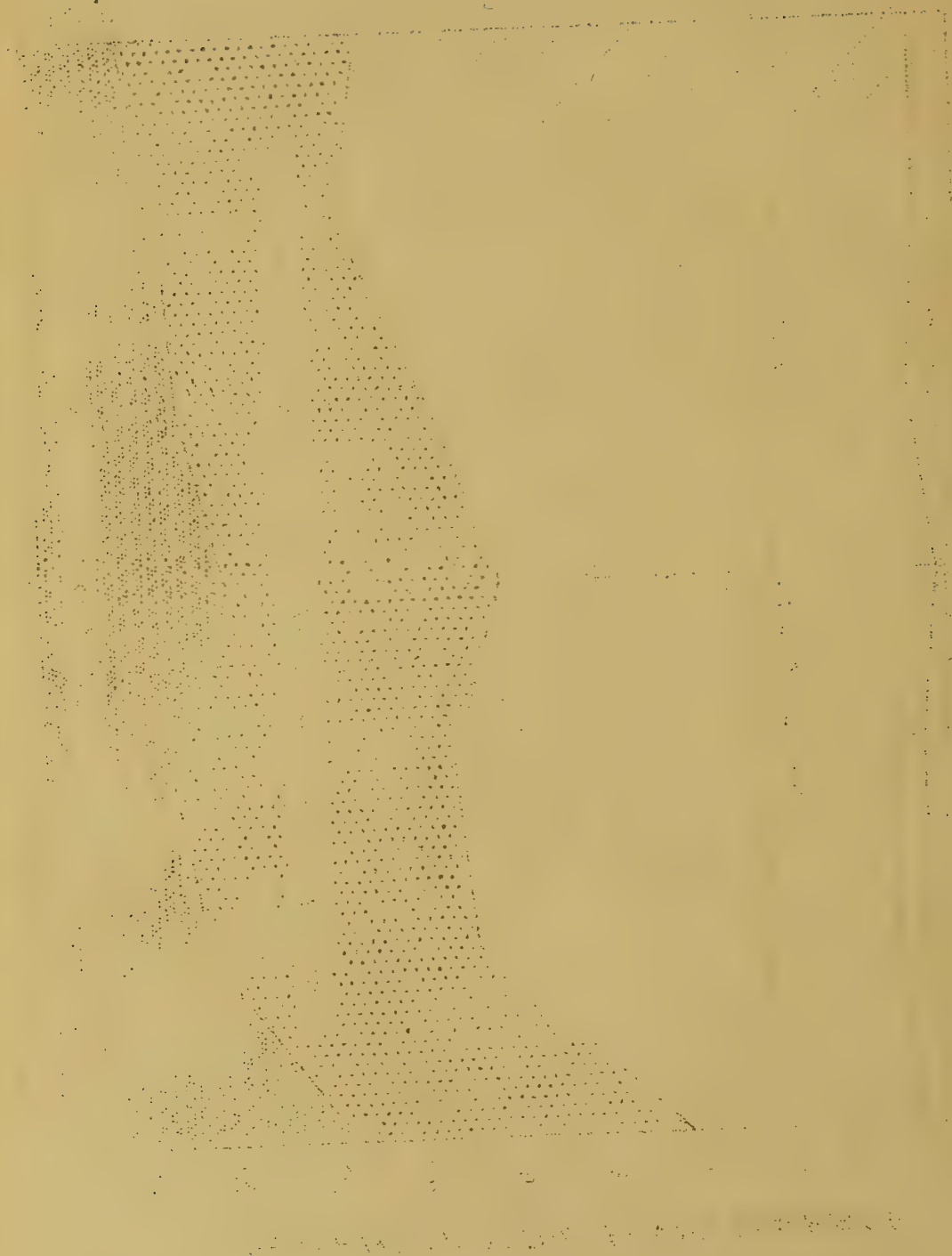


A. Farm Ranch Type (no wheat)

75 to 120 acres of crop land (all used for food crops)

950 to 1000 acres of grazing land

At least 50 head of cows

B. Farm-Ranch Type (small amount of wheat)

160 acres of crop land

60 to 80 acres cash grain

80 to 100 acres food crops

720 acres of grazing land

At least 35 cows, including a few milk cows

C. Farming Type (major income wheat)

200 acres of crop land

120 acres cash grain

80 acres food crops

440 acres of grazing land

18 to 20 cows, including milk cows

In a few small areas where the topography and the soil is exceptionally good and practically all the land is suitable for crop production, it is believed that the following minimum acreage will enable the average farm family to maintain an adequate standard of living.

D. Farming-Dairy Type

185 acres of crop land

100 acres cash grain

85 acres food crops

295 acres of grazing land

12 cows, including 9 milk cows

This minimum was used only in one of the five Morton County sample areas, namely Area No. 5 near Mandan. These estimates of minimum size of units assume an average carrying capacity of 40 animal units per section of grazing land and an average wheat yield of 10 bushels per acre. These assumptions are based on the cultivation of only the land classified as suitable for crop production and the re-grassing of all land now in cultivation but classified as unsuited for crop production. Both the carrying capacity of the pasture and the wheat yield assumed here are considerably higher than the present carrying capacity and wheat yields. The present carrying capacity of the pastures is probably about 30 animal units per section as indicated in Figure No. 10, following page 27 .

The minimum acreages mentioned above are somewhat larger than the minimum sizes of farms suggested by the farmers in the several areas, but it was found that the probable income under normal conditions from the 160-acre, 320-acre, and 480-acre units recommended by some of

the present operators would not be sufficient to support a farm family. Moreover, the extent of and relationship between the crop and grazing lands as classified does not conform to the acreages of crop and grazing land recommended in the small units mentioned by the farmers . In other words, if the operators' suggestions were followed in establishing a minimum size of unit, there would be a shortage of crop land and a surplus of grazing land.

This discussion also brings up the question of the advisability of setting up a strictly cash crop farm organization on any operating unit in the Missouri Slope area even when the use suitability classification of the soils might permit such an organization. In other words, many other factors, beside the use-suitability of the soils on each operating unit and the income needed by the operator of this unit must be considered in determining the best use of the land in the area as a whole. The welfare of groups of people rather than individuals and areas rather than individual operating units must be considered.

It was found that a large number of the present farms lacked sufficient acreage and these units were classified according to the type of land needed in order to meet the minimum requirements outlined

above. This classification for the five Norton County areas was mapped in place as shown on the five Figures No. 38, 39, 40, 41 and 42. The future organization to be recommended for these units was taken into consideration in determining the type and acreage of land needed. This was determined from the amount and type of land now controlled and the present organization of the units as indicated by present crop acreages and livestock numbers. Table No. 23 shows the classification of farms in each of the five Norton County areas as to sufficiency of the present acreage operated.

Table No. 23. Classification of operating units as to sufficiency of present acreage 161 farms, 5 sample areas in Norton County, North Dakota, 1936

Sample Area No.	Total farms in area		Farms Having Sufficient Acreage		Farms having insufficient acreage							
					Total		Needing grazing land		Needing crop land		Needing both crop and grazing land	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	33	100	10	30.3	23	69.7	9	27.3	1	3.0	13	39.4
2	37	100	21	56.8	16	43.2	3	8.1	2	5.4	11	29.7
3	28	100	13	46.4	15	53.6	4	14.3	8	28.6	3	10.7
4	44	100	16	36.4	28	63.6	6	13.6	5	11.4	17	38.6
5	19	100	14	73.7	5	26.3	2	10.5	1	5.3	2	10.5
All areas	161	100	74	46.0	87	54.0	24	14.9	17	10.5	46	28.6

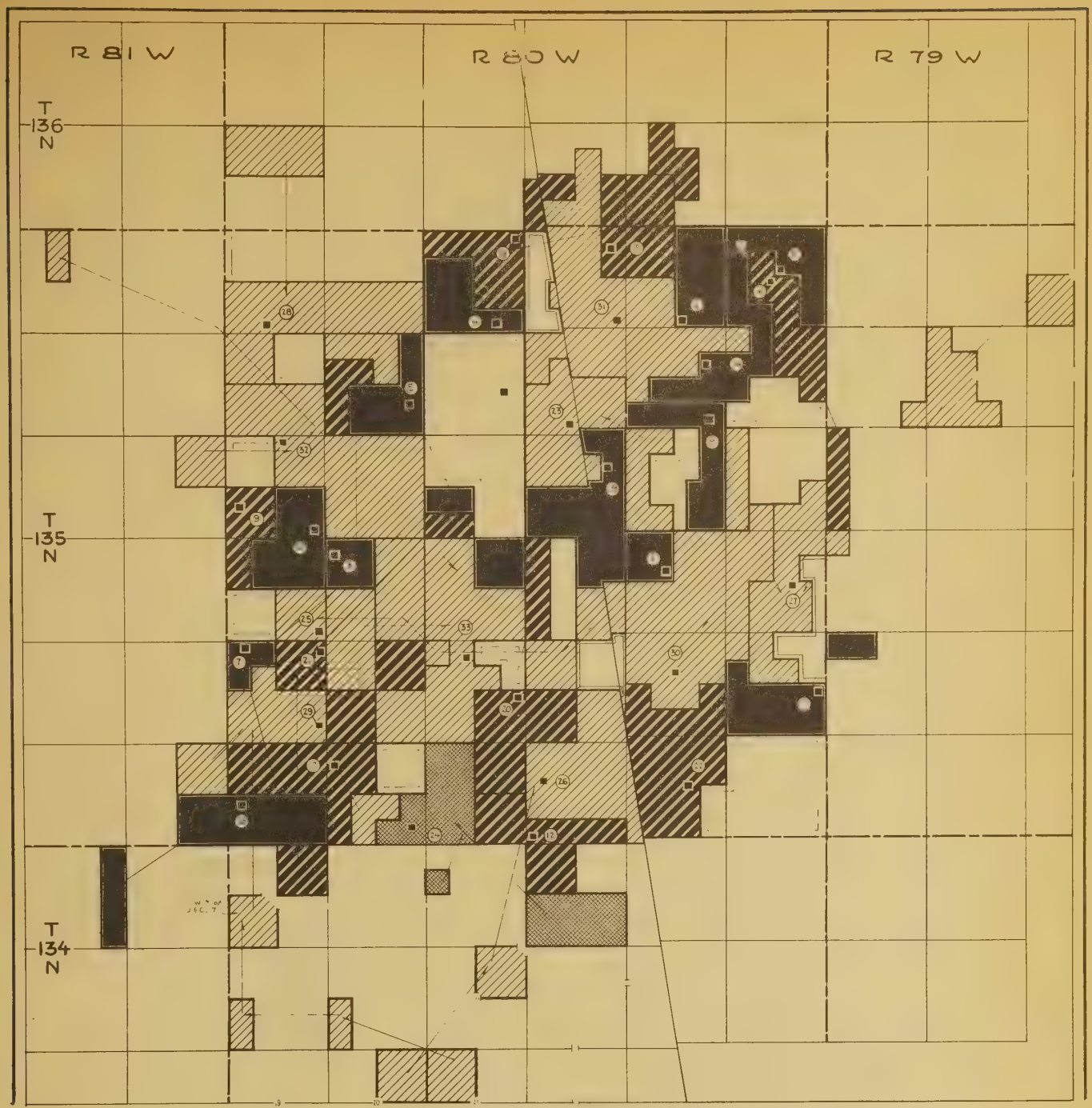


FIGURE - 38

OPERATING UNITS CLASSIFIED ON THE BASIS OF NEED FOR ADJUSTMENT

BASED ON STUDY OF 33 FARMS IN T. 135 N. R. 80 W.
1936 MORTON COUNTY - NORTH DAKOTA 1936
SAMPLE AREA NO. 1

LEGEND

- COMBINATION RANCH - FARM LARGE ENOUGH
- FARM LARGE ENOUGH
- NEED GRAZING LAND
- NEED CROP LAND
- NEED BOTH GRAZING AND CROP LAND
- LAND UNACCOUNTED FOR

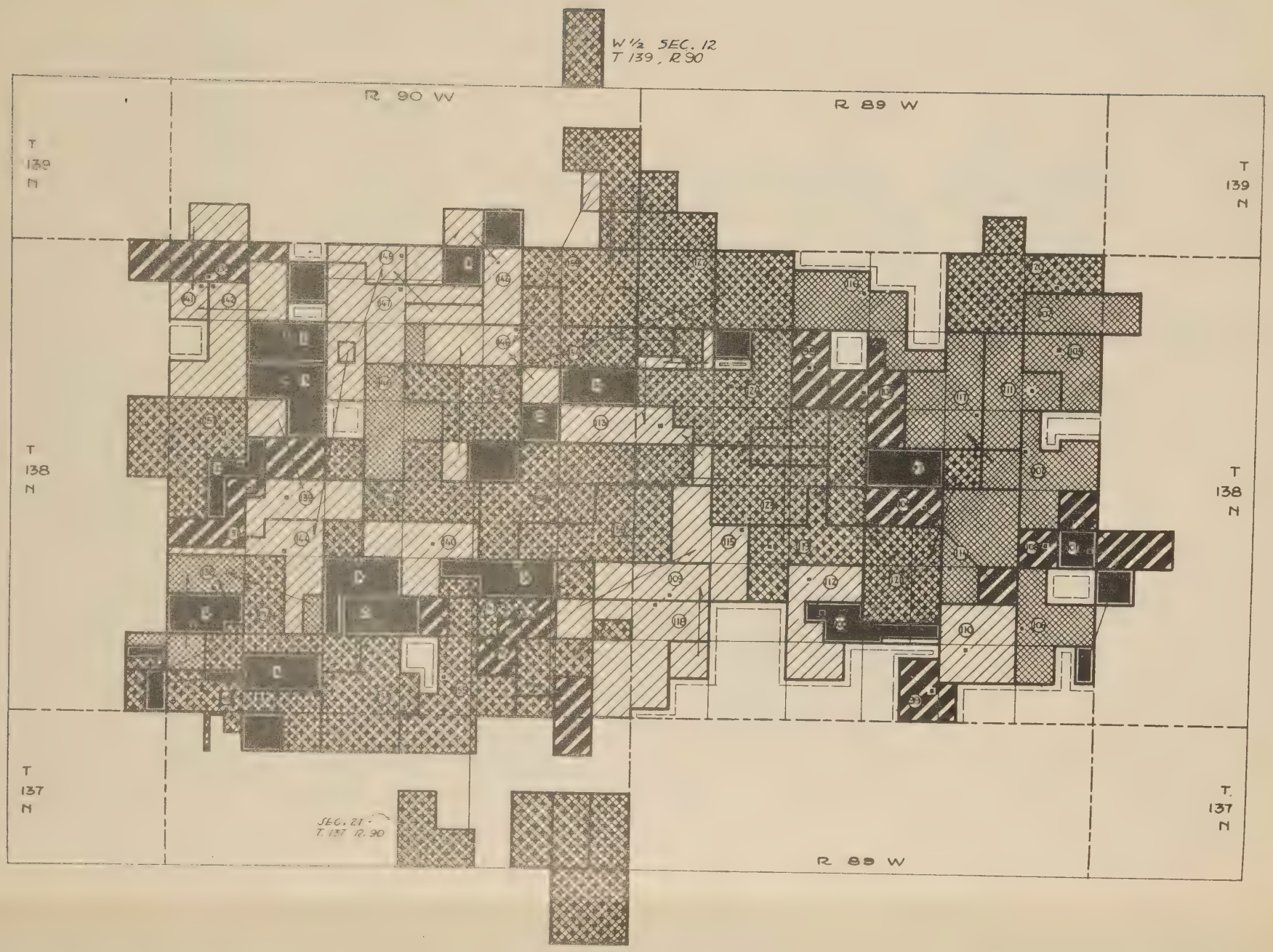
SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATORS HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

PREPARED BY
UNITED STATES DEPARTMENT OF AGRICULTURE
RESETTLEMENT ADMINISTRATION - REGION 7
LAND UTILIZATION DIVISION
LAND USE PLANNING SECTION



FIGURES-39 & 40
OPERATING UNITS CLASSIFIED ON THE BASIS OF NEED FOR ADJUSTMENT

1936 BASED ON STUDY OF 65 FARMS IN TWO TOWNSHIPS. T. 138 N. R. 89 AND 90 W. MORTON COUNTY-NORTH DAKOTA 1936
SAMPLE AREAS - 2 AND 3

LEGEND

- COMBINATION RANCH-FARM LARGE ENOUGH
- FARM LARGE ENOUGH
- NEED GRAZING LAND
- NEED CROP LAND
- NEED BOTH GRAZING AND CROP LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HDQTS.
- SECTION LINE
- TOWNSHIP LINE
- OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES
0 1 2 3 4 5 6

PREPARED BY
UNITED STATES DEPARTMENT OF AGRICULTURE
RESETTLEMENT ADMINISTRATION - REGION 7
LAND UTILIZATION DIVISION
LAND USE PLANNING SECTION

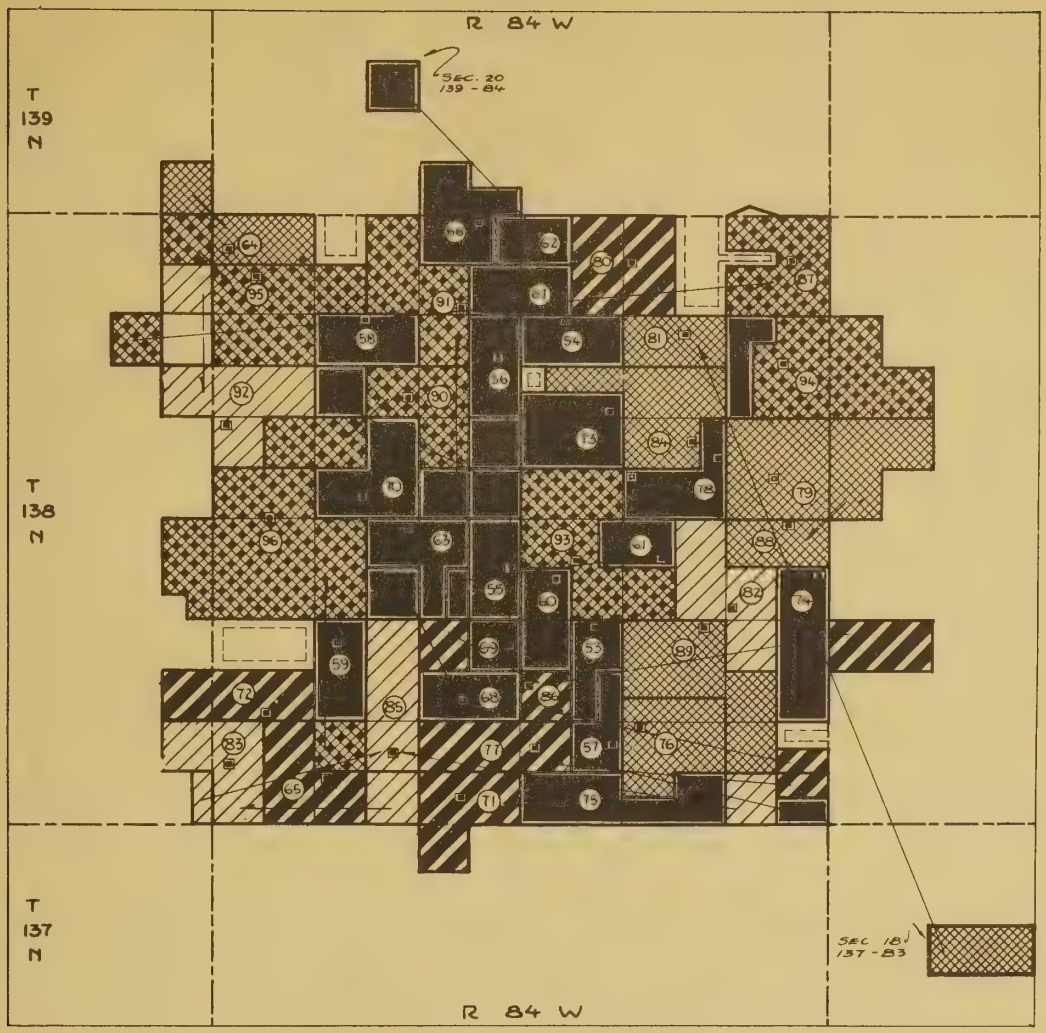


FIGURE-41

OPERATING UNITS CLASSIFIED ON THE BASIS OF NEED FOR ADJUSTMENT

BASED ON STUDY OF 44 FARMS IN T.138N. R.84W.
1936 MORTON COUNTY-NORTH DAKOTA 1936
SAMPLE AREA NO. 4

LEGEND

- COMBINATION RANCH-FARM LARGE ENOUGH
- FARM LARGE ENOUGH
- NEED GRAZING LAND
- NEED CROP LAND
- NEED BOTH GRAZING AND CROP LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE
RESETTLEMENT ADMINISTRATION - REGION 7
LAND UTILIZATION DIVISION
LAND USE PLANNING SECTION

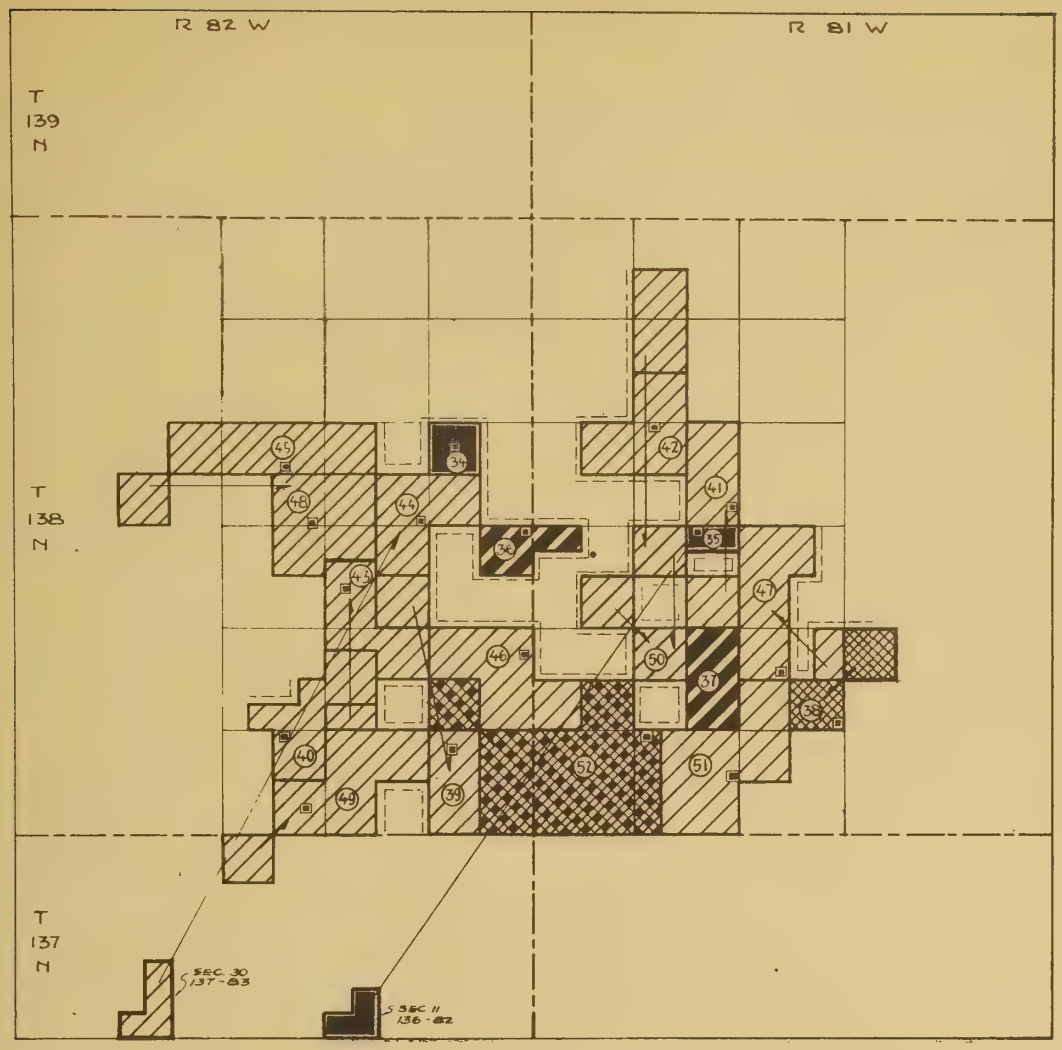


FIGURE-42

OPERATING UNITS CLASSIFIED ON THE BASIS OF NEED FOR ADJUSTMENT

BASED ON STUDY OF 19 FARMS IN T.138N. R.81 AND 82W.
1936 MORTON COUNTY-NORTH DAKOTA 1936
SAMPLE AREA NO. 5

LEGEND

- COMBINATION RANCH-FARM LARGE ENOUGH
- FARM LARGE ENOUGH
- NEED GRAZING LAND
- NEED CROP LAND
- NEED BOTH GRAZING AND CROP LAND
- LAND UNACCOUNTED FOR

SYMBOLS

- OPERATING UNIT BOUNDARY
- FROM NONCONTIGUOUS TRACTS TO OPERATOR'S HEADQUARTERS
- SECTION LINE
- TOWNSHIP LINE
- 211 OPERATING UNIT NUMBER
- OCCUPIED FARMSTEAD
- UNOCCUPIED FARMSTEAD

SCALE OF MILES

0 1 2 3 4 5 6

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LAND USE PLANNING SECTION

In order to make some test of the soundness of the classification of farms as to the sufficiency or insufficiency of their present acreage, the average change in net worth was tabulated for the farms in each class, where the information on the schedules would permit. The results of this tabulation are shown in Table No. 24.

Table No. 24. Average annual change in net worth of operators on farms of sufficient and insufficient acreages, 85 farms in southwestern North Dakota - 1936.

Classification of farms	No. of units	Total years on farm All operators	Total change in net worth all operators	Average annual change in net worth-all operators
Lacking sufficient acreage	44	793	$ 70,916	$ 89
Having sufficient acreage	41	788	192,940	245
All units	85	1581	$263,856	$167

Since the larger units now having sufficient acreage are supposedly self-sufficient and not in need of any relief at the present time, a policy of non-interference was adopted and it was decided that nothing could be done toward taking acreage from some of the extremely large farms and adding the same to smaller units to enable them to meet minimum acreage requirements. Consequently, in order to effect the

needed adjustments as indicated by the above table it was necessary that some of the smaller units needing both crop and grazing land be elimirated in order to provide sufficient acreage for those units which are to remain in the area. With this decision made, enough acreage was taken from the smaller units which were eliminated to enable the remaining units to meet the minimum acreage requirements. The results of this procedure are shown in Table No. 25.

In column 2, this table, the present number of farms is shown for each sample area in Morton County. Column 3 shows the number of units that need both crop and grazing land in order to meet the minimum acreage requirements. The next two columns indicate the present acreage of crop land and grazing land now controlled by these small units.

Column No. 6 shows the number of units needing only crop land or only grazing land to meet minimum requirements, and columns No. 7 and No. 8 show the amount and type of land needed. Columns 9 and 10 show the acreage remaining in these small eliminated units after having rounded out the acreages of all other farms in the area. Columns 11, 12, 13, and 14 indicate the number of various types of minimum sized units which might be built up from this remaining acreage. For example, in Area 1, after supplying all other farms with the acreage they need, 3 farms and 1 farm ranch can be built from the 798 acres of crop land and 2,169 acres of grazing land remaining in the small units.

Table No. 25. Estimated adjustment necessary in number of farms in five sample areas Morton County, North Dakota

Sample Area No.	Present No. of farms	Type and acreage of land (X) now operated by small units to be eliminated			Type and acreage of land needed by other units (Y & Z) to be enlarged			Type & acreage of land remaining in units(X) to be eliminated after enlarging other units(Y & Z) and an estimate of the no. & type of units that might be made from this land						Adjusted number of farms	
		No. of units	Crop land	Grass land	No. of units	Crop land	Grass land	Crop land	Grass land	Farm	Farm-Ranch	Ranch	Total units	Number	Per cent of present no.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	33	13	998	3864	10	200	1695	798	2169	3	1	0	4	24	72.7
5	19	2	121	239	3	154	255	-33	-16	0	0	0	0	17	89.5
4	44	17	2475	4005	11	573	850	1902	3155	8	0	0	8	35	79.5
3	28	3	318	725	12	882	972	-564	-247	-4	1	1	-2	23	82.1
2	37	11	1082	3241	5	216	866	866	2375	2	2	0	4	30	81.1
All areas	161	46	4994	12074	41	2025	4638	2969	7436	9	4	1	14	129	80.1

X - Those units needing both crop and grazing land
Y - Those units needing only grazing land
Z - Those units needing only crop land

Column 15 shows the adjusted number of farms for the area. This is arrived at by subtracting Column 3 from Column 2 and adding Column 14 to the remainder. For example, in Area 1 we now have 33 farms. Subtracting the 13 farms needing crop and grazing land leaves 20 farms. Adding the 4 farms which may be built up from the acreage remaining in the 13 small units after they have supplied all other units in the area with needed acreage, we arrive at a total of 24 farms which can support an average farm family. Column 16 shows the percentage of the present number of farms which the adjusted number of farms represents. For instance, in Area 1 the adjusted number of farms in 72.7% of the present number, and for all the five Morton County areas, the adjusted number is 80.1% of the present number. In these five areas, there should be a net reduction of approximately 20% in the number of farms in order to bring about correct land use and elimination of the present economic and human distress.

SUMMARY AND CONCLUSIONS

The Missouri Slope Area includes the fourteen counties in North Dakota lying south and west of the Missouri River, a little over 12 1/2 million acres. The general topography is a rolling prairie plan marked by a few buttes and broken by the valleys of tributaries of the Missouri River which are bordered by areas of broken land sometimes eroded into "Bad Lands". The soils of the area are for the most part residual and extremely variable. The more extensive soils are generally suitable for cultivation where topography will permit. The climate is characterized by a restricted and variable annual precipitation and a relatively brisk wind movement. Temperatures vary from 90 to 100 degrees in the summer to -30 to -40 degrees in the winter. The frost free period, which varies greatly, averages about 115 days. Hailstorms and hot winds often cause crop damage. The native vegetation includes a number of grasses that afford valuable grazing, although at the present time the native pastures are in poor condition because of drough and overgrazing.

The area was first settled by ranchers who were later crowded out of the better areas by homesteaders, who began cultivating the land, Crop production was very hazardous, because of the limited rainfall, but the profits made in favorable years tempted farmers to cultivate more and more of the land.

The population of the area is composed mostly of foreign born and their descendants, German-Russians and Scandinavians predominating. There are no large cities and little industrial development. The people are dependent upon agriculture for their support either directly or indirectly.

In the 9 sample areas studied, 46 per cent of the land in farms is under cultivation and of the and under cultivation, 50 per cent is used for wheat production. About 80 per cent of the total animal units of livestock in the areas is cattle. Wheat and cattle are the main sources of income.

There is a great variation in the present size of operating units and a wide variation of opinion on the part of the operators as to the minimum size and type of farm needed to support the average farm family. The greatest percentage of the present operating units are included in the 640-acre size group.

There is apparently greater dependence on wheat for cash income as the size of unit decreases and also a tendency to overgraze to a greater degree the small amount of native grass land controlled. Income and living conditions are lowered as the size of unit decreases. There is a crowding of the rural population on the land included in the smaller farms with a corresponding concentration of human and economic distress on the smaller units.

The percentage of owner-operators increases as the age of the operator increases. Land ownership varies greatly between the sample areas, especially in the amount of land owned by non-residents. The percentage of non-resident owned land is much higher in the townships in the western part of the area. The number of ownerships per operating unit varies from one to nine.

Tax delinquency is prevalent over the entire area in varying degrees. Delinquency and type of tenure show little relationship. Apparently there is a tendency to over-assess the poorer quality land under the present system of taxation.

Approximately 36 per cent of the land now under cultivation is unsuited for crop production. The misuse of the land is greater on the smaller units.

Only 46 per cent of the farms now have sufficient acreage to adequately support the average farm family; 54 per cent either need adjustment of some sort or should be eliminated.

The long-time income possibilities of various size and types of units suited to the area indicated that a 640-acre unit is usually the minimum size that will afford an adequate standard of living for the average farm family. In some parts of the area where a greater proportion of the land is suitable for cultivation a 480-acre unit may suffice, and, in other parts of the area more than 640 acres of land

will be needed to support a family. The size and type of the unit required to support a family and make the best use of the available physical resources of the area is dependent upon the extent of and the relationship between crop and grazing land.

The natural agricultural resources of the 5 Morton County sample areas will provide an adequate standard of living for approximately only 80 per cent of the present number of farm families now living within these areas. No attempt has been made in this report to designate suitable areas where the other 20 per cent of the present number of farm families might find alternative opportunities. This problem requires a great deal of investigation and warrants a special study.

In planning a land use program for any region many factors must be considered. Use suitability of the soils in each operating unit and the entreprenurial profits of the individual are important, but the welfare of groups of people and broad agricultural areas must also be taken into account.

While additional data will be required to determine definitely the extent to which the conclusions of this study apply to the entire Missouri Slope area, it is believed that the sample areas in Morton County are reasonably representative of a considerable portion of the area. The conclusions regarding the percentage of plow land which should be regrassed and the required reduction in the number of farm families may be generally applied to Morton, Oliver, Mercer and parts of Dunn

and Grant counties. A general land classification will be necessary in the 4 sample areas located outside of Morton County before conclusions may be drawn for parts of the Missouri Slope area where the size and type of unit and soils are known to be somewhat different from those in the 5 Morton County sample areas.